Terminal Evaluation – Ukraine Municipal Bioenergy

Development and Commercialization of Bioenergy Technologies in the Municipal Sector in Ukraine

***a project of*:**
Government of Ukraine
United Nations Development Programme
Global Environment Facility

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Prepared by:

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Basic Project Information
Official Project Title: *Development and Commercialization of Bioenergy Technologies in the Municipal Sector in Ukraine*
Country: Ukraine
Region: Europe & CIS
UNDP PIMS# 2921
GEF Project ID# 4377
GEF Operational Focal Area: CCM (Climate Change Mitigation)
GEF Operational Focal Area Objective: Objective 3 - Promote Investment in Renewable Energy Technologies
Implementing Modality: Direct Implementation by UNDP
Key Government Partners: State Agency for Energy Efficiency, Ministry of Regional Development; Ministry of Ecology

Terminal Evaluation Team Members
Eugenia Katsigris, Managing Director of Parnon Group: International Consultant
Igor Komendo, Director of GoLOCAL: National Consultant

Terminal Evaluation Timeline
Mission: September 9 – 20, 2019
Main Work: August 26, 2019 – November 30, 2019 (from start of document review to full draft report)
Reviews of Draft Report and Finalization: November 24, 2019 – December 12, 2019
Report date: Dec. 12, 2019

Acknowledgements

The terminal evaluation (TE) team is highly appreciative of the contributions of the many stakeholders who supported the TE through generous contributions of their time, effort, and insights during, before, and after the mission, which took place September 9-20, 2019, in Kyiv, Uman, Palanka, Zhytomyr, and Odessa and involved meetings with various stakeholders, such as national government, municipal, and UNDP officials and experts, consultants, and businesspersons. First and foremost, the current *Ukraine Municipal Bioenergy* project team and UNDP Ukraine Country Office strategized, arranged, and coordinated our mission and have responded promptly and expertly to our many requests for documents and other information. The UNDP Regional Technical Advisor (RTA) responsible for the project provided excellent guidance and invaluable institutional memory on the complete history of the project. Previous project team members and persons previously responsible for the project at the UNDP CO took time out from their current responsibilities to brief us on earlier phases. Experts and consultants to the project, past and present, shared with us their knowledge and explained in detail how their work contributed to project aims. This includes several members of the current "bioenergy roster," who are serving municipalities by providing feasibility studies, guidance on design work, and business advice on how to make municipal biomass projects a reality. It also includes other experts and consultants covering the realms of policy, institutional structure, financing mechanisms, and bioenergy technologies. National-level officials helped us understand the benefits of the project to the nation and its impact on policies and institutions. Municipal governments, a government of federation of villages, and other stakeholders in municipalities (e.g. beneficiaries of biomass boiler installations and investors in the same) explained their realized and pipeline biomass boiler projects, including the benefits and challenges, and discussed their future plans for bioenergy. Banks, an equipment supplier, an association, and other development partners active in Ukraine provided excellent input, each from their angle of expertise, to help us understand the baseline situation, project results, their own related initiatives, and ongoing needs. Specific organizations and individuals are noted with more detail in the realized mission and consultation schedule provided in Annex 1. We wish to thank all of those listed as well as some who participated in meetings or site visits whose names are not included.

Contents

Project Information Table

Project Title	Development and Commercialization of Bioenergy Technologies in the Municipal Sector in Ukraine (*Ukraine Municipal Bioenergy Project*)		
UNDP Project ID (PIMS#)	2921	PIF Approval Date:	June 7, 2012
GEF Project ID (PMIS#)	4377	CEO Endorsement Date:	February 27, 2014
Atlas Business Unit Award #: Project ID:	00074537 00086891	ProDoc Signature Date (date project began):	June 24, 2014
Country:	Ukraine	Date project manager hired:	(*start and end dates*) Sept. 22, 2014 – Feb. 19, 2018 (1st PM, V. Lyashchenko) Aug. 31, 2018 - July 14, 2019 (2nd PM, I. Groza)
Region:	Europe & CIS	Inception Workshop date:	November 19, 2014
Focal Area:	CCM (climate change mitigation)	Midterm Review completion date:	March 29, 2017
GEF Focal Area Strategic Objectives:	CCM Objective 3: Promote investment in renewable energy technologies	Planned project closing date:	June 29, 2018 (*original planned closing date before 1.5 year extension granted*)
Trust Fund:	GEF TF	If revised, proposed op. closing date:	December 31, 2019 (*with 1.5 year extension included*)
Executing Agency/ Implementing Partner:	UNDP (This is a Direct Implementation Modality Project, DIM.)		
Other Execution Partners:	No formal execution partners under DIM Modality. Key informal government partners have been State Agency for Energy Efficiency (SAEE) under Ministry of Regional Development and Ministry of Ecology and Natural Resources (MENR)		
Project Financing (USD)	*at CEO Endorsement (USD) - expected*	*at Terminal Evaluation (USD) – realized as of 11/30/2019*	
[1] GEF Financing:	4,700,000	4,281,216	
[2] UNDP Contribution:	900,000	150,000‡‡	
[3] Government:	8,387,500†	4,727,492*	
[4] Other Partners:	20,750,000‡	406,000**	
[5] Total Co-financing [2+3+4]:	30,037,500	5,283,492††	
TOTAL PROJECT COSTS [1+5]	34,737,500	9,564,708	

†Includes USD 3,270,000 (an in-kind) from national-level government and USD 5,117,500 from municipalities.

‡All was to be cash/investment from private sector/ commercial entities: USD 8,750,000 related to energy crops and USD 12,000,000 from a straw pellet boiler supplier

‡‡In-kind

*From national, oblast, and municipal governments. Of the total USD 268,346 is in-kind and the rest is cash/ investment. Largest individual cash items are: (i) USD 3 million is increased payments for biomass heating after the new tariff enabling biomass heating to receive 90% of gas heating tariff enacted and (ii) US 1 million is loan to Uman Municipality for biomass boiler projects.

**Cash investment from private sector company for Odessa biomass boiler project.

††Breakdown is USD 418,346 in-kind (compared to 9,087,500 targeted) and USD 4,865,146 cash (compared to 20,950,000 targeted)

Acronyms, Abbreviations, and Other Definitions

agri-biomass: Agricultural wastes such as corn husk, cereal grain straw, and sunflower husk that are used as fuel in biomass boilers.
Avers: Company from which the project, during its first phase, procured 12 straw pellet 220 kW biomass boilers.
BMU – German Ministry of Environment.
BSU – Biomass Support Unit: an entity that the project being evaluated aimed to set up.
CCM – climate change mitigation: also a category of GEF projects.
CDR – combined delivery report: UNDP document that shows realized and committed project expenditures.
CER – GEF CEO Endorsement Request. A project design document submitted, along with the project document ("ProDoc"), to the GEF once full project design has been completed.
CER – *alternative meaning* – consequential emission reduction: Indirect emission reduction. Reduction in GHGs as an indirect result of project activities.
CEO – chief executive officer: in this case refers to CEO of the GEF.
CHP – combined heat power: A type of project that provides both thermal energy for direct heating and electricity.
CIS – Commonwealth of Independent States: formed when the former Soviet Union dissolved.
CO – country office: used to refer to UNDP Country Office, in this case the one in Ukraine.
CO_2 – carbon dioxide.
Co-financing: For a GEF project, co-financing is the funding provided by other sources to support the same outcomes and, often, the same outputs and activities as the GEF funds.
CTA – Chief Technical Advisor: role often held by international consultants to support implementation of UNDP-GEF projects.
DERs – direct emissions reductions. Reductions in GHG emissions due directly to activities supported by the project.
DerzhZemBank: State Land Bank under MAPF. Originally meant to play key role in project, but was disbanded shortly after project started.
DIM – direct implementation: a modality of implementation of UNDP projects in which UNDP implements the project directly, rather than through a government partner.
Direct ERs – direct emission reductions. Reductions in GHG emissions due directly to activities supported by the project.
EBRD – European Bank for Reconstruction and Development.
EE – energy efficiency. Informal acronym used in this document.
EEPB – Energy Efficient Public Building project, a UNDP-GEF project in Ukraine currently under implementation.
EE Lighting Project: here refers to a UNDP-GEF energy efficient lighting project in Ukraine that ended in 2017.
energy crop: crop such as willow tree or poplar tree grown to provide biomass fuel for bioenergy installations, such as boilers that provide space heating.
ER – emissions reduction.
ESCO – energy service company: a company that performs energy performance contracting (EPC) in which it pays for and installs energy efficiency equipment in return for cash flow from the client's energy savings over time.
ESCO Project: here refers to a UNDP-GEF energy efficiency project currently under implementation in Ukraine with emphasis on ESCOs and building energy efficiency.
ETS – Emission Trading Scheme.
EU – European Union.
FS – feasibility study: Informal acronym used in this document.

FSM – financial support mechanism.
GEF – Global Environment Facility. Core funding source of this project.
GEF INV – GEF funds designated for investment activities, such as installations or technical designs for installations.
GEF OFP – GEF Operational Focal Point.
GEF TA – GEF funds designated for technical assistance activities, such as promotion of new policies.
GHG – greenhouse gas.
GHG DER – direct greenhouse gas emission reduction. In this report, "direct" means directly due to project activities.
GHG ER – greenhouse gas emission reduction.
GIZ – German Society for International Cooperation: one of the world's largest development agencies, which implements projects on behalf of the Government of Germany.
IC – individual consultant.
IFC – International Finance Corporation: part of the World Bank Group.
IFI – International Financial Institution: in this case refers to international donors that provide large loans with reduced interest rates and sometimes grants to developing countries and transition economies. Examples are EBRD and World Bank.
INV – funds designated for investment in equipment and infrastructure (or, sometimes, feasibility and design work for these), in contrast with TA funds, which are to be used for services. The distinction between TA and INV is used in budget allocations for GEF projects.
IP – Implementing Partner. In a nationally implemented UNDP-supported GEF-financed project, the government agency responsible for implementation.
JSB – joint stock bank.
JSC – joint stock company.
kW – kilowatt.
LLC – limited liability company.
M - million
M&E – monitoring and evaluation.
MAPF – Ministry of Agrarian Policy and Food.
MENR – Ministry of Ecology and Natural Resources.
MMKG: Ukraine-based marketing company that held large awareness contract with the *Ukraine Municipal Bioenergy Project* and, prior to that, with another UNDP-GEF project in Ukraine, the *EE Lighting Project.*
Mtoe – million tons of oil equivalent, a measure of energy.
MTR – midterm review. An evaluation of a project taking place midway through its lifetime.
MW – megawatt.
MWe – megawatt of electric power, also written as $MW_{electricity}$. Used in the case of CHP projects to differentiate electric power capacity from thermal capacity.
MW_{th} – megawatt equivalent of thermal power: Used in cases of CHP projects to differentiate thermal capacity from electric power capacity.
NASU – national academy of sciences of Ukraine.
National Ecology and Nature Center: educational center in Kyiv where 3 of the project's early straw pellet demo boilers were installed. Each are 220 kW. The site was visited during the TE mission.
NGO – non-governmental organization: NGOs are both non-profit and non-governmental.
NPV – net present value.
Oblast: term to designate region or province in Ukraine. There are 24 oblasts in Ukraine.
ODA – oblast development agency.
Odessa: city on the Black Sea in southern Ukraine with population of around 993,000 and located in Odessa Oblast. The city is involved in the project's bioenergy pipeline project work. Odessa has already implemented one of these pipeline projects with funds from a private investor. The *Ukraine Bioenergy*

Project had provided funds for technical design work. Odessa was visited by the TE team during its mission.
OMEA – Odessa Municipal Energy Agency.
Oschad Bank – State Savings Bank of Ukraine. Key partner in project financial support mechanism work.
Palanka: Federation of villages in Uman Rayon, Cherkasy Oblast. Palanka has received support from the project to design bioenergy projects and is now moving forward with implementation of those projects. The TE team visited Palanka during its mission.
PB – Project Board.
PhD – Doctor of Philosophy: an advanced degree.
PIF – Project Information Form: initial proposal for a GEF project. The PIF is a rough concept document. Once approved, the GEF allocates funds for the full project, but detailed project design must be completed and cleared (via submission of ProDoc and CER) before funds can be released. (The GEF often provides separate funds for detailed project design – "PPG" - around the time of PIF approval.)
PIMS – Project Information Management System: A UNDP database system for its projects.
PIR – Project Implementation Review. A template-based document that is prepared mid-year each year for active UNDP-supported GEF-financed projects. The document reviews progress towards results and quality of implementation. It includes an update on the status of each project indicator.
PIU – Project Implementation Unit.
PJSC – Public Joint Stock Company: a term used in Ukraine.
PM – project manager. For *Ukraine Municipal Bioenergy Project*, the person leading the project team and responsible for day-to-day implementation.
Post-project direct ERs – GHG emission reductions due to installations that are the result of project activities, but that are installed and commissioned after the project ends.
PPG – Project Preparation Grant: GEF funds for the detailed design phase of a project.
ProDoc – Project Document. A full project design document. In the case of UNDP-supported GEF-financed projects, the ProDoc is submitted to the GEF along with the CER to receive approval of the full project design.
Project team: In the case of this report, refers to the PIU/ individuals affiliated with the PIU.
PV - photovoltaic.
QA – quality assurance.
Rayon: district, the administrative unit under the oblast in Ukraine. Each oblast has a number of rayons.
R&D – research and development.
RE – renewable energy (abbreviation used in this report).
REA – renewable energy association: A group with links to Ukraine's Bioenergy Association. It is involved in implementing donor projects related to biomass in Ukraine.
RTA – Regional Technical Advisor. For UNDP-supported GEF-financed projects, a regionally-based expert and manager who provides technical and management guidance to the design and implementation of projects in focal areas under his or her purview.
SAEE: State Agency for Energy Efficiency: under Ukraine's Ministry for Regional Development.
SDGs – UN Sustainable Development Goals.
SECO – Sweden's State Secretariat for Economic Affairs' Economic Cooperation and Development arm, which manages Sweden's bilateral aid.
t – metric ton.
TA – technical assistance. Funds designated for services, in contrast with INV funds, which are to be used for equipment and infrastructure. The distinction between TA and INV is used in budget allocations for GEF projects.
TD – technical design: abbreviation used for the purposes of this report.
TE – terminal evaluation. An evaluation conducted towards the end of a project's lifetime. A TE is required for all UNDP-supported GEF-financed projects.
TF – Trust Fund: Refers in this case to source of GEF funds.

TOR – terms of reference. A document describing work tasks. Often used to recruit consultants or contracting firms for a project.
TOV – abbreviation for LLC in Ukrainian.
UAH – Ukranian hryvnia: Ukraine's currency. Very roughly, 1 USD is equal to about 25 UAH.
UkrGasBank – major Ukrainian commercial bank.
Uman: Ukrainian city in Cherkasy Oblast with population of about 83,000, where 3 of the project's 12 early phase demo straw pellet boilers were installed. Uman was visited during the TE mission. Uman is now carrying out a number of additional FS and TD initiatives under the project and thus developing a good pipeline of bioenergy projects. Further, it is the only Ukrainian city to have taken out a loan for bioenergy projects since municipal loans restarted.
UMBP – *Ukraine Municipal Biomass Project*: abbreviation used for the purpose of this report only.
UN – United Nations
UNDP – United Nations Development Programme. GEF Implementing Agency for the project.
UNDP CO – UNDP Country Office. In the case of the *Ukraine Municipal Bioenergy Project*, UNDP CO refers to the UNDP Ukraine Country Office.
UNDP-GEF: Refers to team within UNDP that manages/ advises GEF-financed projects.
UNDP-GEF Project: Project with core funding from GEF that is supported by UNDP as GEF Implementing Agency.
UNDP QA – UNDP quality assurance.
UNOPS – United Nations Office for Project Services.
USAID – US Agency for International Development.
USD – US Dollar.
VAT – value added tax
Verkhovna Rada: Parliament of Ukraine.
Zhytomyr: Ukrainian City with population of about 266,000 and located in Zhytomyr Oblast. Four of the project's 12 early phase demo straw pellet boilers were installed in Zhytomyr, which the TE team visited during its mission. Zhytomyr is also preparing an investment project under the UMBP's pipeline bioenergy project work. Moreover, the city has goals to eventually achieve on average 95% of its heating from biomass and has received funding from SECO for a major wood-based bioenergy project.

Executive Summary

Project Background

- The Government of Ukraine-UNDP-GEF project *Development and Commercialization of Bioenergy Technologies in the Municipal Sector in Ukraine* has $4.7 M in GEF funding, committed co-financing of $30,037,500, and 4 components: (1) policy/ planning, (2) biomass support unit, (3) bioenergy investments and financing, and (4) awareness. Originally a 4-year project launched in June 2014, it has received a maximum extension of 18 months and now is a 5.5 year project closing in Dec. 2019.
- The project aim is to accelerate the adoption of agricultural biomass for municipal sector space heating and hot water provision (a huge portion of energy use; in practice, includes district heating in cities as well as "off-grid" boilers at city institutions, such as schools and hospitals).
    - The technological scope is solid biomass (not biogas and not liquid biofuels).
- By design, the project focuses on agricultural waste based biomass instead of wood (though supports "energy crops" that are trees, but not forest, e.g. willow). The thinking is that Ukraine is a "breadbasket" country (with lots of agricultural wastes), but lacks forests.

History

- The project was launched at a tumultuous time, just 4 months after Ukraine's Feb. 2014 revolution.
- The project had a complete change of key persons from March 2017 to early 2018 (CO portfolio manager, CTA, project manager, and Parliamentarian on board). For last 1.5 years, project has been led by new project team, working with team of bioenergy experts; and great progress has been made.
    - History of project can be divided into two main phases plus an interim period: (1) "First phase" - first 3.5 years, June 2014-Dec. 2017, with first PM and, joining later, first CTA. (2) "Interim period" – 6 months of Jan.-June 2018, a transition period when not much happened. (3) "Second phase" – last 1.5 years, July 2018 – Dec. 2019, with 2nd PM and 2nd CTA.

Terminal Evaluation

- The TE team conducted 53 interviews and a 2 week mission, including 3 days of site visits to Uman, Palanka, Zhytomyr, and Odessa. All sites have pipeline or implemented projects under new project team. Two of sites (and Kyiv's Nature Center, also visited) have grant demos from under old team.

Project Overall

<u>Relevance – Need and Innovativeness</u>

- Focus on municipal agri-bioenergy in Ukraine is highly relevant, as municipal heating is an under-addressed segment within bioenergy; and agricultural wastes are an under-addressed feedstock, wood being 90% of solid biomass capacity in Ukraine. The "straw/ stalks" biomass category has potential to rise from 0.08 toce in 2017 to 5.26 toce in 2035, which is 53% of the total 2035 bioenergy forecast.

<u>Results and Impacts – Most Striking</u>

- Most important project result is development over past 1.5 years of extensive municipal bioenergy project pipeline with 48 projects across 35 cities. Project supported 33 feasibility studies and 19 detailed technical designs. Support of designs is a new area that increases likelihood of implementation. Most impressive is that many of the pipeline projects are likely to be implemented, vast majority without funding from project. Considering implementation probability of each project (see Exhibit 11 on page 26), TE team estimates at least 25 projects (over half) will be implemented.
- Via its financial support mechanism work with IFC, the project enabled relaunch of municipal loans in Ukraine, which had halted since 2012 – a significant and meaningful feat. Work included developing a credit rating system for municipalities that could be used instead of collateral (which

municipalities are unable to provide) to reduce the reserve ratio required to be held by banks for such loans. So far, only one bioenergy loan (≈US 1 M to Uman from UkrGasBank) and only 6 loans total have been made to small and medium sized cities (≈US 25 M in aggregate, all from UkrGasBank, compared to ≈US 217 M in aggregate to large cities), so further barrier removal work is needed. At the same time, it should be noted that extremely high and unstable interest rates in Ukraine have been a disincentive for municipalities to pursue the loans that are now available to them.[1]

- TE findings indicate project strongly contributed to change of mindset of municipalities, leading to substantial and serious bioenergy pipelines in certain cities, especially Zhytomyr, Odessa, and Uman.
    - Following project-supported feasibility study, Kiyvsharivka City (Kharkiv Oblast) spent USD 240,000 on design for 25 MW_{th}, 10 MW power CHP project requiring US 35 M investment.
- With a focus on schools with its installations and especially installation at the Nature Center in Kyiv, project has opportunity to impact the thinking of the next generation.
- Project's Bioenergy Working Group hosted by MENR likely was a major factor in MENR prioritizing biomass for € 7 M in BMU funding for its International Climate Initiative (IKI)[2] in Ukraine, the only such BMU funding targeted for a specific sector under IKI in Ukraine.

Challenges

- Project as implemented during first 3.5 years showed lack of focus on its targeted objective-level and outcome-level results. For example, there was no effort to develop a pipeline of bioenergy projects that did not depend almost entirely upon grant funding. Also, policy work during that period was overly broad, with 12 different individual consultants hired and lack of evidence of results.
- The project in its first 3.5 years did not recruit persons with strong expertise in bioenergy and instead appears to have attracted mainly generalists to apply for consultancies.
- During the first part of the project, GEF funds slated for investment were not used strategically. There was a USD 1.5 million contract with a supplier to provide a type of straw pellet biomass boiler that appears to have had low probability of replication due to costs. While 12 grant boilers have been installed, there are no municipal replications; and private sector replications have not been confirmed. GEF funds covered 100% of boiler and installation costs, with limited related support from municipalities (up to 15% of total costs), despite ProDoc stipulation of maximum 25% grant. Relatedly, most of the co-financing indicated in the ProDoc failed to materialize. Yet, due to a change in strategy the last 1.5 years, significant investment is expected to be mobilized after project close.
- The first part of the project showed a lack of cost effectiveness. The two prime examples are the USD 1.5 million boiler contract and a USD 753,000 awareness contract. The first may have been almost twice the price it should have been and the second, perhaps three times. For the latter, the number of trainings required (338) seems excessive. With a lower number of trainings, the reasonable contract size would have been even lower. The awareness contract was not in the approved budget and was charged to the wrong component, but was eventually cancelled, a success of UNDP QA. Payment to vendor was around USD 235,000.
- The project faced major challenges due to the country situation, but, instead of using adaptive management to find new and innovative ways to address project aims, in the first 3.5 years, the aims seem to have been treated as untenable, resulting in an unsustainable focus on 100% grants for boilers. Adaptive management was indeed carried out the last 1.5 years with excellent results, but it was late. The project would have benefitted greatly if it had been carried out earlier.
- The project during its first 3.5 years focused on sub-optimal government partners. Even at project launch, SAEE would have been the proper government partner for achieving policies to promote biomass and for reaching out to municipalities to encourage them to implement bioenergy projects.

[1] Throughout 2014 to 2019, the interest rates have changed significantly, with a peak value at 30.0% in mid-2015, and a low of 12.5% in mid-2017.
[2] Request for proposals was issued in December 2018.

- Decision-making and oversight functions were flawed. The project's oversight body, the Project Board, seems ad hoc without a clear decision-making process or clear guidelines for membership. Further, the project in its early phase did not respect the oversight role of UNDP-GEF, namely the RTA role in approving major changes to the budget. The US 753,000 awareness contract was signed without the required RTA approval of budget revisions.

Component 1 – Policy

- Project drafted numerous policies in first 3 years, but lacked focus. Work included amendments to laws, strategies, and action plans, together covering a range of areas, such as renewable energy, heating, rural development, housing, power, and budget code. Scope was much broader than bioenergy. Project claimed success with respect to 4 adopted policies including a critical bioenergy tariff policy, ESCO policy, and general space heating and utility policies, but no stakeholders confirmed these were attributable to project. Consultants lacked bioenergy expertise.
- Project had success its first 3 years in getting 8 oblast-level bioenergy plans (or bioenergy sections of plans) adopted, but follow up needed to ensure these don't "sit on the shelf" was not carried out.
- In its final year, project is carrying out one very focused policy initiative to develop law for bioenergy crops. Strong focus of work and expertise of consultant makes this work look very promising.

Component 2 – Biomass Support Unit (BSU)

- Project made efforts to liaise with Ministry of Agriculture, targeted entity to house BSU, with no success. Most deem BSU target impractical, as government lacks staff and funds. Project did not consider out-of-the-box solutions, such as non-government alternative. Project might have considered setting up a long-term platform in Ukraine Bioenergy Association (http://www.uabio.org), which has done a large amount of work in bioenergy and is the leading organization in Ukraine in the field.
- Project set up cross-ministerial Biomass Working Group led by MENR. This met 5 times, but did not encompass agri-biomass. It had no major achievements and stopped meeting after project support stopped. Yet, it played a role in decision of BMU to support bioenergy development in Ukraine.
- The project bioenergy expert roster, which has been conducting feasibility studies and supporting design work the last 1.5 years, may be considered a sort of BSU. Yet, it won't be sustainable unless the project finds a way to ensure the list of consultants is maintained and shared, ideally with some kind of central coordination. This might be pursued with a period of incubation support by the UNDP-GEF Ukraine Energy Efficient Building Project (EEBP), before being taken over for the long-run by SAEE or the Ukraine Bioenergy Association, and ideally with a means of generating group revenue to facilitate a one-stop-shop central advice/ coordination platform.

Component 3 – Investment/ Installation

<u>Bioenergy Project Pipeline</u>

- Project has created an active pipeline of 48 projects that is moving forward, with two already implemented and probably at least 23 more likely to be implemented in the coming few years.
- Conservative estimates suggest project on track to roughly achieve GHG direct emission reduction targets, though much will be post-project. The pipeline projects are estimated to mobilize about USD 5 million in co-financing (conservative estimate) and about 300,000 tons CO_2 in direct emission reductions. This is an impressive feat, given that this work was initiated only about 1.5 years before project close and that support levels are quite low, namely, USD 5,000 per feasibility study and USD 5,000 to 10,000 per technical design, with perhaps up to only USD 350,000 spent in total on such items. Only 4 of 48 projects are receiving some project grant funds for their installation. Estimates are based on expert input/ TE team assessment of likelihood of implementation of each project.

Financial Support Mechanism

- Project work led to relaunching of municipal loans, which likely occurred years before it would have in the absence of the project. Timing of first loan (Dec. 2017) correlates with work of project.
    - National Bank now allows bank reserve rate to be based on municipality credit rating.
    - Ministry of Finance clarified procedures for municipalities to apply to Ministry for permission to take out a loan. This is especially helpful for small and medium sized cities.
- TE team impressed with mindset change of banks, which now see municipalities as attractive clients.
- The number of loans is still limited (21 to date); and only one bioenergy loan has been made. The majority of loan volume is going to larger municipalities. High interest rates deter small and medium-sized cities, which need to be educated on the value of loans, even in a high interest rate environment.
    - Aim of work to launch a "municipal credit product" for renewable energy and energy efficiency projects might be said to have been partly achieved by relaunch of municipal loans and education of banks on RE and EE projects. Yet, very limited uptake (1 bioenergy loan), while due to high interest rates, confirms job is only partly done. Bioenergy projects believed to have more potential for uptake than EE projects due to size and non-ESCO structure.

Straw Pellet Boiler Installations

- 12 installations: 3 in Uman, 4 in Zhytomyr, 3 at Kiev Nature Center, and 2 in Donestsk. Project funds covered full costs of boilers and installation, along with one year of pellets and maintenance.
- Beneficiaries are off-grid (not on district heating system) and benefit from lower fuel costs than when they used gas boilers. Systems work well, though locations other than Uman must now pay Avers (the straw pellet boiler supplier) for annual maintenance.
- Bioenergy experts suggest that in the straw and stalk category, corn stalk has greater potential than straw, strengthening the question of why the project chose to focus all 12 of its early demos on straw pellet boilers that are high in cost, rather than diversify.
- Avers, the supplier, has been in an R&D phase with its boilers since 2008, when it started to work on them. It hopes to ramp up sales soon, but is most interested in the export market (Europe).

Component 4 – Info and Awareness

- TE team found evidence of positive impact of domestic study tour carried out by new project team.
- Booklets/ guides prepared by REA (Ukraine Bioenergy Association-linked organization) as part of training sub-contract to main training contractor received positive feedback from several sources.
- Project could have benefited from more outreach to cities last 1.5 years to increase number of competitive applications for support. Yet, cancellation of awareness contract was the correct move.
- At the same time, the project pipeline work is a form of awareness raising for involved municipalities.

Project Design

- The core focus of the design, which emphasizes stimulation of a municipal bioenergy project pipeline (with maximum 25% grant), via feasibility studies was quite on target as a means of reaching the project objective. This has been borne out by the results of the work the last 1.5 years of the project.
- Design might have emphasized broader range of feedstocks and should have given corn husk more prominence than cereal straw, given forecasts of potential contribution to overall bioenergy in future.
- Stakeholders indicate more work is needed to establish agri-biomass supply chain and standards for biomass. These are areas the project might have addressed.

Ratings

- Overall rating on efficacy is Moderately Satisfactory. Current project team has done an excellent job the past 1.5 years addressing project objective and respecting original spirit of project design. Project is on track for a compelling impact. Yet, efficacy was low first 3.5 years. (See below for ratings table and Annex 4 for explanations.)

Evaluation Ratings:			
1. Monitoring and Evaluation	***rating***	**2. IA& EA Execution**	***rating***
M&E design at entry	MS	Quality of UNDP Implementation	MS
M&E Plan Implementation	MS	Quality of Execution - Executing Agency	NA
Overall quality of M&E	MS	Overall quality of Implementation / Execution	MS
3. Assessment of Outcomes	**rating**	**4. Sustainability**	**Rating**
Relevance	R	Financial resources:	ML
Effectiveness	MS	Socio-political:	L
Efficiency	MS	Institutional framework and governance:	L
Overall Project Outcome Rating	MS	Environmental:	L
First 3.5 years[3] Overall Project Outcome Rating	*MU*	Overall likelihood of sustainability:	ML
Last 1.5 years Overall Project Outcome Rating	*S*		

Recommendations Based on Lessons Learned

Recommendation #1: In future projects that aim to stimulate investment in desirable technologies and infrastructure, adopt *Ukraine Municipal Bioenergy Project's (UMBP's)* approach of generating a large investment project pipeline and do so from start of project: Develop a roster of experts and support not only feasibility studies, but especially technical design. Coach cities on economic viability and consider adding to the "formula" follow up support to get projects funded. As for UMBP's pipeline, try to identify a means of providing follow up coaching post-project to get remaining unfunded projects funded.

Recommendation #2: Take ownership of success of project's financial support mechanism work in achieving re-launch of municipal loans in Ukraine, which had stopped completely in 2012, and follow up to stimulate uptake: Prepare promotional materials on this achievement and the opportunity presented to small and medium cities, as these are not well known. Consider, though an ongoing project or small newly designed project, pursuing follow up to stimulate uptake of loans by small/medium cities, an underserved space for loan finance, and to stimulate municipal bioenergy loans, only one of which has been realized to date. Educate small and medium cities on "doing the math," which will show some high-return projects to be attractive even with high loan interest rates; and provide support to smaller cities in getting their accounting in order for loan applications.

Recommendation #3: Learn from UMBP's challenges in setting up a biomass support unit: (i) For similar work in future projects, consider option of setting up sustainable non-government institution to support development of targeted type of investment projects. (ii) Consider alternatives for turning UMBP's bioenergy roster into sustainable platform. Support for incubation by EEPB Project might be used to launch a long-term bioenergy-specialized platform that assists clients in development of bioenergy investment projects, in cooperation with Ukraine Bioenergy Association, which could become the eventual home of the platform. (iii) For a general platform to provide TA support of investment projects in multiple priority areas (i.e. not only bioenergy), consider setting up long-term platform in Ukraine, perhaps within UNDP CO. This platform may serve multiple donor projects over time, especially in the area of getting small and medium-sized investments financed, which is a niche area for UNDP in Ukraine.

[3] Project altogether has a duration of 5.5 years. Roughly speaking, the first project team was in place the first 3.5 years. After that, there was an interim period of almost 0.5 years in which not much happened. The new project team was in place roughly the last 1.5 years.

Recommendation 4: Consider addressing high potential needs areas in future donor biomass projects implemented by UNDP in the near-term: (a) Work to develop the agri-biomass supply chain (a gap in current project), including development of biomass exchange, biomass standards and certification, and support to municipalities in sourcing biomass. (b) Transition of rural households from wood use to agri-biomass (such as briquettes) for use in current or newly promoted efficient stoves. (c) Sourcing work to identify best fit biomass boilers on the market, so as to reduce costs and increase lifetimes. (d) Policy work to promote agri-biomass, in particular, and biomass generally, such as adjustment of green tariff to favor agri-biomass, preferential policies or subsidies for agri-biomass (for briquette/pellet makers, boiler producers, and storage companies), regulations to support bioenergy crop legislation, support for Ukraine integration with EU biomass policies, and support to open up heating market to third parties (which would stimulate investment in bioenergy heating).

Recommendation 5: Make national policy and oblast planning work in future projects more results oriented: Policy work should be more focused, targeting adoption of a few top priority policies and ensuring these are squarely within the targeted results area. This would be in contrast to the approach used by the project at first in drafting as many policies as possible in a broad range of areas in hopes that a few would make it. Ideally, specific targeted policy topics would be identified during project design. If possible, policy work should be carried out by experts with strong experience in the relevant sector, who should be encouraged to apply for consulting opportunities. Oblast-level planning work should include follow-up support to ensure adopted plans are implemented, in contrast to the situation of the project in which plans were adopted but not followed up upon.

Recommendation 6: Ensure work in future projects is action oriented. Adopt a strict policy of limiting studies/ reports in future projects to those that will truly be used and ensure other project activities are designed to leverage these to support targeted results. Consider requiring preparers of reports to carry out action-oriented follow up related to their work, perhaps with success criteria as a condition for final payment.

Recommendation 7: To enhance sustainability of *UMBP's* 48 pipeline projects and potential for replication of them, prepare a brief compendium of case studies of the pipeline projects, with 1 or 2 pages per project, and combine with a final lessons learned summary for the project. The case studies may serve a dual purpose of attracting financing and stimulating similar projects in other municipalities. The compendium should be shared with the banks to encourage loan financing and with as many municipalities and village federations as possible. Follow up in 1 and then 2 years to determine number of projects implemented, investment mobilized, and implied lifetime GHG ERs.

Recommendation 8: For future projects that have demos and target replication of them, ensure financial viability is a priority for all demos. Consider including sourcing work to find lowest cost quality equipment option and communicate results to projects developers. A lesson learned from this project is that high cost demos may not be replicated. Future projects should make financial viability a cornerstone of demonstrations so that replication can be achieved.

Recommendation 9: Leverage lesson learned on the effectiveness of domestic study tours: A domestic study tour allows participants to see the technology or approach of interest in their own national environment, which may give them a more realistic example than something they would see abroad. Use domestic study tours as an effective means of building awareness and developing an investment project pipeline in future projects, with added benefit of high cost efficiency. Include municipal officials in such study tours when relevant to the project topic. If it can be arranged for 2020 (post-project), consider second domestic study tour for UMBP, possibly in conjunction with final workshop.

Recommendation 10: In design phase of future projects, be careful not to lock in suppliers and other partners without competition, unless there is strong rationale. Even in the case of choosing municipalities to receive support, competition or at least consideration of multiple possible partners is the best approach. Competition will ensure better value for equipment and that the involved cities are the most proactive, have the best proposed projects, and provide substantial co-financing.

Recommendation 11: For directly implemented projects, develop clear guidelines on Project Board (PB) membership and PB role, as well as on how decisions will be made. In *UMBP*, PB decisions were used to justify changes, such as the large allocation from the investment component for awareness/ training. Yet, membership of PB and PB's decision making process seemed ad hoc, without clearly defined guidelines.

Recommendation 12: For future projects, take greater care in selecting government project partners to ensure partner is optimal one for project at hand. UMBP did not partner closely with SAEE, the optimal partner, until its last 1.5 years and may have thus had less impact than it might have. In general, as there are overlapping areas of interest among government entities, selection of government partners should include careful analysis that considers the specific aims of the project, such as policy adoption, projects on the ground in municipalities, etc. As the DIM is currently being used by UNDP Ukraine for its GEF-financed projects, partner selection is a less formal process than determining IP for NIM projects; and, thus, UNDP has greater leeway in partner selection.

Recommendation 13: Take concerted steps to improve procurement: (i) In recruiting personnel and contractors for future projects, work harder to reach out to and include those that have relevant expertise to ensure the best candidates for project staff and consulting positions get involved with projects. (ii) For future projects, incorporate more measures for cost control and getting the best price in procurement, with a key step being to first determine the "real, reasonable" price. (iii) For major procurements, evaluation panel members should include technically qualified subject matter experts and/or persons that understand the aims of the respective project well, including participants from regional offices or headquarters for all large procurements. Ensure existing procedures/ systems for large procurements are followed.

Recommendation 14: Improve understanding of GEF projects in CO and improve interface between UNDP-GEF and CO: Improve understanding of UNDP CO leadership regarding the GEF approach and priorities (such as GHG emission reductions and replication of demonstrations), typical problem areas to watch for in UNDP-GEF projects, and implementation rules, via two-page checklist. Ensure systems facilitate means of getting quick feedback to CO from UNDP-GEF, such as regarding major procurements and budget changes.

Recommendation 15: Step up gender strategy of UNDP CO and its projects by looking to promote talented and high integrity women to leadership positions, including project manager roles and roles as leading consultants on projects. UMBP had some women in leadership positions as consultants, but, overall, women were substantially underrepresented. Only two of 17 participants in the 2015 international study tour were women. As UNDP also faces challenges in finding quality and high integrity persons as project managers and other leaders in its projects, tapping the pool of qualified women may be a way to address both issues at the same time.

1. Background, History, Approach, and Focus

1.1 Project Basics and Design

This terminal evaluation (TE) report assesses the Government of Ukraine-UNDP-GEF project *Development and Commercialization of Bioenergy Technologies in the Municipal Sector in Ukraine*. In this document, the project will be referred to by the abbreviated names of *Ukraine Municipal Bioenergy Project* or *Ukraine Bioenergy Project*. The project has USD 4.7 million in GEF funding and indicates USD 30,037,500 in co-financing committed at the time of full project design. The project was designed as a four-year project, to run from June 2014 to June 2018. It received the maximum allowable extension of 18 months so that its full duration is now 5.5 years - from June 2014 to December 2019. The project is directly implemented by UNDP, though national-level officials from different government bodies have been involved in the project board and various project activities.

Exhibit 1. Project Components, Outcomes, GEF Budget and Brief Description of Realized Activities

1. Policy and Plans ("Component 1: Market-oriented policy and legal/regulatory framework for municipal heat and hot water supply strengthened") (USD 370,000 of GEF TA funding)
Outcome 1A. "Streamlined and comprehensive market-oriented policy and legal/regulatory framework to promote biomass for municipal heat and hot water services." *In practice, the project carried out a range of policy consultancies and participated in government policy roundtables.*
Outcome 1B. "Municipal Targets for Biomass Energy for heating are agreed and established." *In practice, the project developed and got adopted a number of oblast-level bioenergy plans.*
2. Institutional Capacity ("Component 2: Sustainable Biomass Support Unit in place, with technical capabilities of stakeholders") (USD 460,000 of GEF TA funding)
Outcome 2A. "Capacity available within MAPF (Ministry of Agrarian Policy and Food) to develop and support a municipal biomass programme." *In practice, the project set up a cross-ministerial biomass working group that is no longer meeting. It also established a group of bioenergy consultants under the project to provide feasibility study and technical design support to municipalities.*
Outcome 2B. "Capacity available within DerzhZemBank to evaluate the economic and financial viability of municipal biomass systems and process loans to developers." *DerzhZemBank disbanded shortly after project launch, but project trained other banks on this topic.*
3. Investments in Municipal Biomass ("Component 3: Promoting investment in municipal biomass through the establishment and strengthening of a Financial Support Mechanism") (USD 3.25 million in GEF INV, investment, funding)
Outcome 3. "Investment promotion in municipal use of biomass through establishment and strengthening of Financial Support Mechanism." *In practice, project provided majority of investment for 12 "off-grid" straw pellet biomass boilers in municipalities; was responsible for the relaunch of municipal loans in Ukraine; and developed a large number (48) of pipeline municipal (non-wood) biomass projects via support of feasibility studies and detailed technical design. It also supported small-scale planting of willow trees as energy crops in 3 locations.*
4. Awareness ("Component 4: Increased investor, municipality, and consumer awareness.") (USD 400,000 in GEF TA funding)
Outcome 4: "Outreach programme and dissemination of project experience/best practices/lessons learned for replication throughout the country." *In practice, project conducted study tours, held conferences, prepared brochures/ booklets, prepared guidebook, conduced some trainings, and developed project website.*

The aim of the project is to accelerate the adoption of agricultural biomass for municipal sector space heating and hot water provision. (The official objective is quoted below, though it does not mention the

important aspect of focus on agricultural biomass within the biomass category.) These applications of municipal space heating and hot water constitute a major portion of energy use in Ukraine. In practice, municipal sector space heating includes both district heating in cities as well as "off-grid" boilers (not connected to district heating networks) at city institutions, such as schools and hospitals. As clarification, the project addresses use of solid biomass for these applications, not biogas and not liquid biofuels. By design, the project focuses on agricultural wastes instead of wood, though ended up having a small proportion of work on "energy crops" that are woody (willow trees). The thinking in project design, which, as will be discussed, appears quite justified in terms of need, is that Ukraine: (a) does not have enough wood to satisfy potential solid biomass demand; and, at the same time, (b) is considered a "breadbasket" country and therefore has lots of agricultural wastes that could be used as bioenergy.

Objective: The project objective as articulated in the CER is "to promote biomass-based municipal heat and hot water services. It will reduce direct GHG emissions by 63,577 tons of CO2 over its 4-year project life and 19,143 tons of CO2 during each year of the remaining 16-year life of the boiler equipment." While the objective does not state the focus on agricultural over woody biomass, this focus is understood from the details of project design.

Components and outcomes: The project as designed has four components and six outcomes, shown in Exhibit 1 as stated in the CER. CER-designated GEF funding amount and the TE team's brief description of realized activities (the latter *in italics*) are also given.

1.2 Terminal Evaluation: Purpose, Methodology, Challenges and Limitations, and Content of Report

Purpose of terminal evaluation: The purpose of the terminal evaluation (TE) is three-fold: (1) transparency – information and assessment on whether the funds spent have led to progress towards intended results in a way that is both cost effective and ensures sustainability beyond the life of the project; (2) recommendations of actions that may be taken by stakeholders to ensure sustainability of positive project results and build upon those results to continue progress towards project objective and outcomes; and, (3) lessons learned and recommendations from the project's experience that may enhance design and implementation of other UNDP projects and programs in Ukraine and elsewhere in the world.

Methods of terminal evaluation: The TE team made use of document review, extensive consultations, site visits, and additional information requests in its methodology. They reviewed a set of basic project design and project management documents initially provided by the project team. The TE team further requested of the project team a list of all individual consultancies (any contract value) and a list of all contracts with organizations with value of over USD 10,000. They requested these lists show the name of individual/organization, size of contract (in USD), main topic, amount paid to date, start date, end date, and status (see Exhibit 2 for depiction of table headings). In addition, they requested reports associated with these individual consultancies and organization contracts. The project team provided the contract listings and associated documents in a well-organized format, which impressed the TE team and is greatly appreciated by them. Access to the contract listings and associated documents substantially enhanced the ability of the TE team to get a clear view of how project funds had been spent and reconstruct the story of the project. This was sorely needed as the project has experienced a lot of turnover in its team and in the CO team overseeing it during its lifetime. Based on findings from the contract listings and associated documents, the TE team requested some additional stakeholder consultations during the TE mission, in addition to those initially recommended by the project team.

Exhibit 2. Depiction of Column Headings for Requested Contract Information for ICs and Contracted Organizations

Name of individual/ organization with whom/ which contract is signed	Main topic of work/ nature of good or service	Contract size (USD)	Amount paid to date	Start date	End date	Status

The TE team conducted a two-week mission in Ukraine from September 9 – 20, 2019. The mission consisted of consultations in Kyiv and site visits, also with consultations, to three municipalities (Uman, Zhytomyr, and Odessa), one village federation (Palanka, visited in the same trip as Uman), and one organization in Kyiv (the Nature Center) that benefited from the project. Three of the sites (Uman, Zhytomyr, and the Nature Center in Kyiv) had benefited from straw pellet boilers procured and installed fully with project funds (though some limited local co-financing was provided for infrastructure, such as cement base) early in the project. Four of the sites (Palanka, Odessa, Zhytomyr, and Uman) have benefitted from recent project support (during project's last 1.5 years) for agri-biomass boiler feasibility studies and technical design and are likely to install associated boilers soon, either fully with their own funding or with more limited grant support (up to 30%) from the project.[4] For interviews, the TE team had prepared a master interview template covering the main topics and sub-topics in this report and used it to guide interviews, as relevant. The team met with a range of stakeholders from the UNDP CO (current and past) and the project team (current and past). They also consulted with the UNDP RTA, national government officials, bioenergy experts, equipment providers, consultants and contractors to the project (on policy, institutions, financing, technical/ project development, and awareness), municipalities, school and hospital beneficiaries, banks, other donors and persons involved with other UNDP-GEF projects in Ukraine, etc. Before and after the mission, the TE team conducted a more limited number of Skype consultations. In all, 53 consultations were conducted, with stakeholders consulted and site visits carried out summarized in Exhibit 3. The mission schedule, including the specific persons met, is provided in Annex 1. Following the mission, the TE team drafted up its meeting notes and carried out further document review and analysis before preparing this report. The two TE team members exchanged ideas frequently prior to, during, and after the mission to develop the TE conclusions and recommendations.

Challenges and limitations: The TE team faced both general challenges and limitations common to evaluation of UNDP-GEF projects and challenges and limitations specific to the *Ukraine Bioenergy Project*. In general, UNDP-GEF projects cover a large mass of information, many activities over several years, and many stakeholders. The amount of information can be overwhelming and cannot be comprehensively covered in the time allotted to the evaluation. To address this challenge, the team put the strongest emphasis on the questions of whether progress has been made towards the project objective and outcomes, whether this progress is due to the project, whether spending had been cost effective, and whether results will be sustainable. Further, recognizing the benefit of direct stakeholder input, the team focused during the mission on interviewing as many key stakeholders as possible, saving any outstanding document review work and analysis until after the mission. In addition, the team worked to focus its analysis by reviewing contract values and prioritized researching the items with the largest expenditures. Lastly, the team focused its interviewing and information gathering on the targeted topics in the TE report outline it had prepared. Yet, despite these measures, the TE team must acknowledge the limitation that certain findings and conclusions in this report are not definitively proven, but instead represent the professional assessment of the TE team based on available information and our capacity to review and assess that information in the time period available.

[4] Installation of one of these pipeline projects has already been completed in Odessa.

Exhibit 3. Stakeholder Interviews and Site Visits
≈ 53 interviews conducted (location is Kyiv unless otherwise noted)

Project Team and UNDP CO (with current responsibility for Project)	
2nd CTA, who is also Interim PM (*2 interviews*)	UNDP Program Analyst, 3rd responsible for project QA
Project Team and UNDP CO as a group	RTA (*3 interviews via Skype*)
UNDP Ukraine Resident Rep and team	UNDP CO M&E team
Project Team and UNDP CO (with previous responsibility for the Project)	
1st Project Manager (*via Skype*)	Previous UNDP Portfolio Manager (1st responsible for QA)
2nd Project Manager (*via Skype*)	2nd UNDP officer responsible for QA of project
1st CTA (*via Skype*)	Consultant to project on reporting and TOR preparation*
National Government	
State Agency for Energy Efficiency	Ministry of Ecology and Natural Resources (consultant for Biomass Working Group)
Former Vice Chair of Parliament's Energy Committee	
Bioenergy Experts, Equipment Provider, and Technical Consultants to the Project	
Ukraine Bioenergy Association representatives	Aver-Tech Director (supplier of boilers to project)
Team Lead, Project Bioenergy Experts (*2 interviews*)	Norsk Energy (project design phase consultant)*
Project feasibility study expert #1	Project feasibility study expert #4
Project feasibility study expert #2	Project technical design expert #1
Project feasibility study expert #3	Project technical design expert #2 (*met in Zhytomyr*)
Policy, Institutional, and Awareness Consultants to the Project	
Current policy consultant (energy crops)	Previous consultant for preparing a biomass support unit
Previous lead policy consultant (*via Skype*)	MMKG (awareness contractor) (*via email*)
Banks and Financial Sector	
UkrGasBank	IFC – carried out assignment supported by project
Int'l Financial Consultant to Project (*2 interviews*)†	
Other Donors and Persons Involved in Other UNDP Projects	
GIZ	EBRD
PM of UNDP-GEF *Ukraine ESCO Project*	TE Consultant, UNDP-GEF *Ukraine EE Lighting Project**
SITE VISITS AND ASSOCIATED CONSULTATIONS	
Uman (*including site visit to school utilizing project-supplied straw pellet boiler*)	
Deputy Mayor	Department of Housing and Communal Services
Mayor	Staff of school with project-supplied straw pellet boiler
Palanka (*including site visit to school where straw biomass boilers will be installed based on project-supported technical design*)	
Deputy Major of Federation, Mayor of Palanka, Head of International Cooperation, leading business person	
Zhytomyr (*including site visits to a school and a kindergarten utilizing project-supplied straw pellet boilers*)	
Zhytomyr City Government, Education Sector Persons	Zhytomyr Municipal Enterprise
Staff of school with 2 project-supplied boilers	Staff of kindergarten with project-supplied boiler
Odessa (*site visit to hospital with sunflower husk boilers, technical design of which was supported by project, and to second hospital where TD for future sunflower husk boiler is being supported by project*)	
Odessa Development Agency (*two meetings, one at sites and one in office*)	Company investing in boilers; also design and construction company; chief of facilities of first hospital
Kyiv – National Ecology and Nature Youth Center (*site visit to educational center utilizing 3 project-supplied straw pellet boilers*)	
National Ecology and Nature Youth Center Director	

*via Skype
†Second interview via Skype

Challenges and limitations specific to evaluating the *Ukraine Bioenergy Project* and the way they were addressed are:

- Changes in management of the project and in QA person at UNDP made it difficult to get information on the first 4 years of this 5.5 year project: To address the challenge, the TE team interviewed as many persons from the early stages of the project as possible. They further reviewed documents and procurements from this period, as provided by the project team and UNDP CO. At the same time, it should be acknowledged that the TE team had much more time with and better access to those persons currently involved with the project and limited access to those no longer involved with the project.
- Cost effectiveness of some of the larger and earlier contracts seemed questionable in terms of pricing, but good information on reasonable prices was lacking: The TE team consulted experts in the relevant fields to better understand market pricing. Based on information gathered, the TE team has made conclusions about cost effectiveness that we believe are valid. Due to time limitations, however, the market research conducted was not extensive.
- Lack of replication of the project's 12 straw pellet boilers under largest contract of project (over USD 1.5 million) was not easy to confirm; and, once confirmed for this municipal market, this lack of replication was not easy to fully explain, though the 100% grant procurement was understood to be part of the problem: The TE team was able to consult several bioenergy experts on a one-on-one basis to understand the type of agri-biomass projects each had seen being developed and to understand which types of projects have the best financial returns in Ukraine today. The team was also able to speak with the straw pellet boiler manufacturer. While we feel confident in our conclusions on and explanation of lack of replication of this specific type of boiler (straw pellet) attributable to the project, there was a lack of time and resources to carry out comprehensive research and assessment on these topics.

Content of TE report: The main body of the TE report includes 16 sections. It is preceded by the Executive Summary, which includes a description of the project and its progress/ results as determined by the TE, along with main recommendations. Section 1, Project Background, includes a brief summary of the project as designed; the TE purpose, methodology, challenges, and content; the project timeline and early history; project institutional and personnel history; and country situation during the project and bioenergy potential. Section 2 looks at the project overall, addressing the project's: relevance; most notable challenges, concerns, and shortcomings; most notable results and impacts; and relevance and impacts vis-à-vis UNDP priorities and country programming. This "big picture" section is deemed necessary before delving into each component, separately, so that the reader will understand the most important takeaways and holistic view of the project. The report then addresses the results/ effectiveness of each of the project components. As Component 3 has the most significant results and these cover three major areas, the Component is addressed first and over three sections, one on each of: (1) The current (last 1.5 years of project) work on project-supported feasibility studies and design, which is leading to installation of municipal bioenergy projects either without project funding or with a maximum of 30% grant funding for equipment. (2) The financial support mechanism work (which made possible the reintroduction of municipal loans in Ukraine). (3) The early straw pellet boiler demonstrations (with equipment and installation fully supported by GEF funds). This third section on Component 3 also includes other, smaller budget initiatives under the component conducted during the first 3.5 years of the project. The other three project components are addressed in the next three sections: (4) policy, (5) institutional capacity, and (6) awareness. The subsequent section addresses cross-cutting aspects of results, including GHG ERs, sustainability, stakeholder engagement, and gender. The next section assesses project design, implementation, and M&E. While the design has been described already in this introductory section, the later section, with the benefit of hindsight, addresses how the design might have better facilitated progress toward project objective and outcomes. Next, cost effectiveness, which includes expenditure analysis and presentation of co-financing is addressed, highlighting some shortcomings in

cost effectiveness. The last section presents lessons learned and recommendations. It suggests steps to enhance the sustainability of results of the *Ukraine Municipal Bioenergy Project* and discusses how future UNDP projects and programming may benefit from the lessons learned in this project. The report further has nine annexes, as listed in the table of contents, eight provided in this document and the ninth, the GHG tracking tool, provided in a separate document.

1.3 Project Timeline and Issues during Early History

Project timeline: Exhibit 4 shows the project timeline. According to sources, the project concept of agri-bioenergy was first discussed in 2008, suggesting a long time for development -- around six years --with the PIF being approved about four years after early discussions and project launch about two years after that. Interestingly, other sources indicate that 2008 was when Avers, the supplier with the USD 1.5 million project contract for boiler provision, first began looking into straw pellet boiler production. This early conceptual phase was previous to the current RTA taking up his post. The prior RTA, coincidentally, is the same person who became first CTA of the project. The project concept took a relatively long time to get approved. With first submission in Sept. 2010, the concept was finally approved by the GEF 18 months after it was first submitted. The full project design was approved in Feb. 2014, about 23 months after project preparation funding of USD 90,000 was approved and about 20 months after the project concept was approved. Nowadays, GEF project design is restricted to 18 months.

The full project was launched in June of 2014 with ProDoc signing. The MTR Report (finalized in March 2017) recommended (recommendation 6) a no-cost extension of 1.5 years (the maximum possible) until the end of 2019. The formal request for extension was prepared in 2017, but was not approved by the RTA, who stated the following conditions for the approval: (i) cancellation of the large awareness/ training contract signed in June 2017 and (ii) revision of the implementation strategy. These requirements were met by April 2018, when a new CTA came on board; and a new extension request was prepared (by the newly appointed CTA) in May 2018, which was approved by the beginning of June 2018.

Exhibit 4. Project Timeline

2008	Sept. 2010	March 2012	June 2012	Feb 2014	June 2014	June 2018	December 2019
Early discussion of concept	First submission of PIF (project concept)	PPG (project preparation grant) approved	PIF (project concept) approved	Full project approved	ProDoc signed; official project start	Original end date	End date with extension
Parallel developments in the country→				Revolution in Ukraine; government overthrown*			

*See sub-section 1.5 for situation in Ukraine during project.

Early involvement of bioenergy expert and plans for city competition: During the design phase, a bioenergy consultant with Ukraine experience was hired from Norway with a contract of USD 20,000 and for this (1) prepared a relatively high quality technical "Help Guide" to bioenergy (which has been reviewed by the TE team), (2) presented at two workshops in Ukraine, and (3) prepared a TOR for cities that would be competing to participate in the project. During this period, one city (the mid-sized city of Sumy), exposed to this expert, is indicated to have expressed special interest in the competition by writing a letter to UNDP, a very positive development. Yet, in the end, it appears that the project in its design

phase and first four years, despite this work in developing plans for a competition among cities, did not select cities based on such a competition. Further, the consultancy, which seemed promising and might later have led to engagement of this quality consultant in the project implementation stage, was cancelled by UNDP with only partial payment, despite virtual completion of work. The reasons given for the cancellation, based on available evidence, do not seem very convincing to the TE team. Given that most consultants hired the first 3.5 years of the project lacked bioenergy expertise and given the challenge the project had in gaining cities' interest, it seems unfortunate that this consultant's contract was cancelled.

Early involvement of boiler provider: According to sources, the company Avers, which eventually held the largest contract of the project, for USD 1.5 million, to supply straw pellet boilers to municipalities, was also involved at this early stage of project design. During a PPG phase visit to Avers' Uman-based facilities, the design phase team was reportedly shown Avers' straw pellet production line, but not its boiler line, which is surprising given the very large contract eventually signed with Avers for boilers. While involvement of the private sector in the PPG phase may have advantages, it would typically be more strategic to involve multiple private sector companies to learn about their equipment and interest them in potentially bidding on procurement opportunities with the project rather than involving just one such company.

1.4 Project Institutional and Personnel History and Related Issues

Implementation mode: Given the political upheaval at about the time full project design was approved (see subsection 1.5), UNDP Headquarters recommended that the implementation mode of the *Ukraine Bioenergy Project* be shifted to direct implementation (DIM). The project thus used UNDP DIM mode.

Project Board and its meetings: According to available documents, the Project Board has met four times, once in each of 2015, 2016, 2017, and 2018. The TE team sees a lack of clarity for this directly implemented project on who, outside UNDP, should have been involved with the Project Board; what the mode of decision making of the Project Board should be; and what the influence of the Project Board over the project should be, particularly given that board members do not appear to be fixed and seem to be invited based on ad hoc decision-making. While there may be rationale for keeping these meetings open and encouraging broad attendance, if that will be the approach, it does not seem reasonable to make the body a decision-making one. This issue comes to light particularly with regard to a controversial awareness contract of USD 753,000 that was signed and said to be agreed upon by decision of the Project Board. Other substantial decisions, such as city selection, grants, etc. were also said to be justified by Project Board agreement. Exhibit 5 summarizes attendance at these four Project Board meetings. In addition to a need for clarity on who will be invited to board meetings and the influence of these persons in decisions, there may be a need for a more strategic approach to selecting board members. For example, the minutes of the first three of four meetings list the Deputy Chair of the Environment Committee of Parliament first among Government attendees. Yet, consultations during the TE mission suggest that the Energy Committee of Parliament would have been the more appropriate partner to support the project in getting bioenergy-related legislation passed. This problem of not getting the partner right, may have been a continuation from the Ukraine UNDP-GEF *EE Lighting Project*, in which the same Deputy Chair of the Parliament's Environment Committee played a key role. That project was reportedly not very successful in getting legislation passed, either.

Project government partners: The CER indicates the Ministry of Agrarian Policy and Food as the project's Executing Agency and, in terms of national-level government, also lists MENR and the Ministry for Regional Development as Executing Partners. Because the project was shifted to DIM once implementation began, partnership with national government agencies has mainly been achieved through involving them in activities and consultations. TE findings indicate that the Ministry of Agriculture, once

Exhibit 5. Attendance and Apparently "Membership" of Project Board

Type of Attendee	June 16, 2015	Feb. 5, 2016	March 31, 2017	Dec. 20, 2018
Government-Parliamentarians	-Deputy Chair Environment Committee	-Deputy Chair of Environment Committee	-Deputy Chair of Environment Committee -2 consultants to Parliamentary committees	-First Deputy Chair of Construction Committee -Consultant to Parliament
Government – Executive Branch	-Deputy Minister Regional Development	-Deputy Head of SAEE -Head of dept. related to housing, Ministry of Regional Development	-2 advisors to Vice Prime Minister -3 reps from MENR (including GEF OFP) -2 reps from Ministry of Regional Development -SAEE rep -Head of lab of State Fiscal Service	-National Energy Regulatory Commission rep -Ministry of Regional Development rep -3 reps of SAEE
UNDP CO	3 persons	2 persons	3 persons	6 persons
Project Team	2 persons	2 persons	2 persons	2 persons
Consultants to Project	-Lead policy consultant	-Lead policy consultant -2 other consultants	-Lead policy consultant -1 other consultant	2 person
NGOs	---	-All-Ukrainian Ecological League	-All-Ukrainian Ecological League -Ukrainian Nature Protection Society -2 other nonprofits	--
Other	---	---	-5 PMs for other projects -1 consultant for other project	-2 from ESCO project, 1 consultant to that project
Total	**8 persons**	**11 persons**	**29 persons**	**20 persons**

implementation began, was never very responsive to outreach for involvement. The project during its first phase (first 3.5 years) seemed to focus at the national level most closely on MENR, particularly in having MENR host its cross-ministerial biomass working group. While there is overlap in responsibility of various ministries and the identity of the right partner is not always crystal clear, findings during the TE suggest that SAEE, under the Ministry of Regional Development, would have been the more effective partner for the project. Indeed, during its last 1.5 years, the project shifted to working with SAEE in promoting its work to municipalities and this was found to be particularly effective. On the policy side, experts involved in bioenergy policy promotion have suggested to the TE team that, even six years ago when the project began, SAEE was the most effective partner for promoting bioenergy-related policies. It thus seems the project may have been somewhat off-track in pursuing partnership with the Ministry of Agrarian Policy and then MENR in its aims to get bioenergy policies adopted and to get municipalities to implement bioenergy projects.

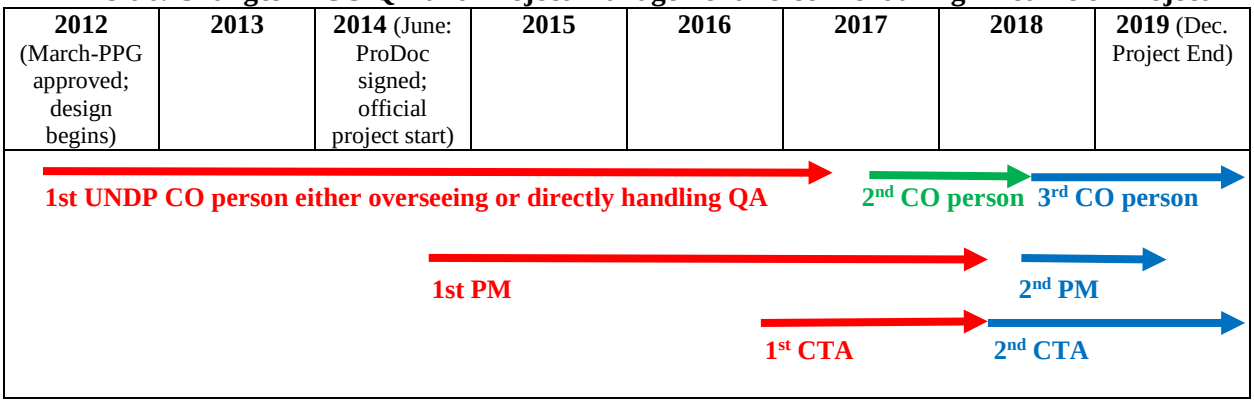
Yet, there is also evidence that UNDP CO made efforts to involve SAEE as a leading partner and signed an agreement to this effect in 2015 under the *Ukraine Bioenergy Project*, but that the project was not successful in its first 3.5 years in bringing the relationship to fruition. The Partnership Memorandum signed by SAEE and UNDP under the Bioenergy Project indicates SAEE's responsibilities as follows: "To promote the formation and effective functioning of the Coordination Council of the Project, headed by the Deputy Head of SAEE for monitoring project implementation and achievement of the objectives set out in the preamble." It is curious that this agreement was signed, but there was no realization of it during the project's first 3.5 years. After the new team came on board, the relationship with SAEE quickly developed.

A lesson learned is that a more careful analysis of appropriate partners may be needed prior to implementation and any roadblocks to cooperation with the most appropriate partner be fully probed and dealt with. Project targets (such as policy adoption and outreach to municipalities) should be considered in this regard. At the same time, it is recognized, as indicated by some stakeholders, that circumstances (such as MENR being the GEF focal point) may require a balance in involving various government partners.

Changes in UNDP CO and project management personnel: The project during its 5.5 years had substantial turnover in UNDP CO personnel overseeing it and in direct project management personnel. Indeed, during the transition from the first 3.5 years ("first phase") and interim period (0.5 years) to the last 1.5 years of implementation ("second phase"), there was a complete change of all working level people involved, which actually began a little less than 3 years into the project. This resulted in a complete change of project strategy as well.

The rough timeline is shown in Exhibit 6. The first phase of implementation, the first 3.5 years of the project, lasted from June 2014 to December 2017. The MTR was delivered about 2.75 years into this phase, following which the first project team had another 0.75 years to course correct. The interim phase of about six months was from January to June 2018. During this time, a large awareness contract was cancelled in February 2018; and the first project manager and first CTA left during the same month. The second CTA came on board in April 2018, preparing the project's new strategy. During the second phase of implementation, the last 1.5 years of the project, from around July 2018-Dec. 2019, the project implemented its new strategy with this second CTA, a new project manager, a new project associate, and extensive cooperation with the Ukraine Bioenergy Association.

Exhibit 6. Changes in CO QA and Project Management Personnel during Lifetime of Project



The TE team finds that the strategy adopted in the last 1.5 years of the project, which focuses on stimulating wide-spread adoption of bioenergy by municipalities via support for feasibility studies and technical designs, as well as more limited support for domestic study tours and a very focused policy initiative, fits better with the project's targeted objective than the approach taken over the project's first 3.5 years. The latter consisted of a combination of boiler procurements fully supported by GEF funds, awareness initiatives, various grants, and very broad policy efforts with unclear achievement. It is noted, however, that, as compared to the situation at start of project, implementation as the project went on had the benefit of rising natural gas prices that have been making bioenergy more and more attractive and decentralization that has been giving municipalities more control over their budgets. Over the course of its lifetime, the project has had two project managers and an interim project manager (the second CTA) twice. It has had at least three different persons in the CO overseeing QA and has also had two different CTAs, the first not hired until almost 2.5 years into the project. While stability might generally be

preferred, in this case the changes appear to have brought, starting in July 2017, improved quality control to address serious challenges and, starting in July 2018, a new strategy that set the project on a more effective course for progress towards it objective.

1.5 Situation in Ukraine during Project, Bioenergy Potential, and Fit of Project

Geopolitical developments: During the same month that the full project design was approved, February 2014, a revolution took place in Ukraine, whereby violence in the capital of Kyiv led to the ousting of the elected "Russia-friendly" Ukrainian President and overthrow of Ukrainian Government in favor of a more "West-friendly" regime. Nearly 130 persons are said to have been killed. Shortly after this, Crimea, a part of Ukraine in the south of the country, was annexed by the Russian Federation in February and March 2014. Starting in March 2014, the War in the Donbass (including Donetsk and Lugansk Oblasts in Eastern Ukraine) began. This is an armed conflict between pro-Russian separatists (which many claim have strong Russian support) and the Ukrainian Government. The conflict resulted in thousands of deaths and a perhaps a million people leaving their homes. It continues to the present, though with a lower frequency of casualties. Significant portions of Donetsk and Lugansk Oblasts continue to be controlled by separatists rather than the Ukrainian Government. These developments, with the chaos peaking around the time the full project design was approved and with political feelings running high among the citizenry, some with pro-West and some with pro-Russian sentiments, need to be considered in assessment of project results. Namely, the project came on the scene for implementation in a chaotic and difficult time in Ukraine's history.

Drivers and progress in adoption of bioenergy in municipal heating and hot water supply: Building space heating along with hot water supply is responsible for a substantial share of Ukraine's energy use. The residential sector alone, for example, in 2016 accounted for 33 percent of energy end use in the nation and 80 percent of that use was for heating and hot water.[5] Thus, heating and hot water in the residential sector alone accounted for 0.33 x 0.80 or 26% of energy end use in 2016. Rising natural gas prices are an important driver of the attractiveness of bioenergy for use in municipal heating and hot water. Natural gas import prices rose sharply for Ukraine in 2012. The picture is complicated, as there has been fluctuation in import prices and in the level of subsidy for residential heating (which has been highly subsidized over the years). Yet, consultations during the TE mission made it very clear that municipalities are anxious to replace gas with biomass and have been for some time, in order to cut their costs. In addition to high prices of natural gas, another important driver that has led to the increased utilization of bioenergy is that Ukraine has experienced problems in natural gas import, resulting in a reduction of gas imported. Substitution of natural gas with national resources (such as locally produced biomass for heating) without compromising the quality and level of service has been one of the highest priorities of energy policy of Ukraine, a key element of its energy security strategy.

Due to gas tariff increases, bioenergy for heating installations have increased rapidly starting in 2015, so that, according to government sources, 2,265 MW have been installed since the beginning of that year. According to experts, the majority of that amount is woody biomass, but perhaps 10 percent, or about 230 MW, and roughly 230 projects, are agri-biomass, especially sunflower husk. The majority of this growth in bioenergy based heating is said to be in the industrial sector, with very little activity until just recently in the municipal sector (which is the focus of the project being evaluated). Given that the majority of this 2,265 MW of installed capacity is wood, while the project is focusing on agri-biomass, the role of the

[5] UNDP Ukrainian language report accessible at https://www.ua.undp.org/content/ukraine/en/home/presscenter/articles/2016/11/09/heating-and-hot-water-cutting-half-of-ukraine-s-energy-import-needs-and-bill-.html.

project in this growth is probably limited. Because the project's early phase demos all focused on straw pellet boilers, of which replication has not been verified, the project may not have even had much of an influence on the nation's estimated 230 MW of agri-biomass installations to date (mostly industrial). These early phase demos, however, have probably contributed to stimulation of a limited amount of realized sunflower husk pellet (≈3 MW) and wood boiler installations (≈2.5 MW) (most also attributed to the project's work in facilitating municipal loans) and played a role in stimulating pipeline plans for a much larger capacity of wood installations down the road.[6] As for the existing estimated 230 MW of agri-biomass installations, in the second half of 2017, the project prepared some brochures related to agri-biomass heating, which may have had some impact, as indicated by the many interested parties with which these materials were shared. Further, it is believed that what the project is now doing in developing an agri-biomass project pipeline can eventually contribute to stimulating growth of this underdeveloped segment.

Exhibit 7. Ukraine Solid Biomass Stats and Targets
Summary of Figures Provided in the Text

Bioenergy heating installations 2015-2019	≈2,265 MW	Bioenergy heating installations 2015-2019 that are agri-biomass	≈230 MW (about 230 installations and 10% of total bioenergy heating)
2017 share of RE in heating	7.6% (80% of which is biomass)	2035 share of RE in heating (target)	40% (70% of which will be biomass)
2019 share of biomass in municipal heating	3%	2035 share of biomass in municipal heating (target)	20%
Share of residential heating in Ukraine's overall energy use (2016)		26%	

Targets and projections in the development of agri-biomass heating: Estimates by the Ukraine Bioenergy Association suggest that renewable energy accounted for 7.6% (80% of which is biomass) of Ukraine's heat production in 2017 and is targeted to rise to 40% in 2035. (Please see Exhibit 7 for a summary of figures in this paragraph and in the preceding sub-sub-section.) Within municipal heating, according to the Association, biomass accounts for just roughly 3% at present, but is targeted to rise to 20% by 2035. These numbers reflect that the adoption of biomass has been much faster in the industrial heating sector than in the municipal heating sector and show that the project, by focusing on municipal bioenergy, is working in a needed area.

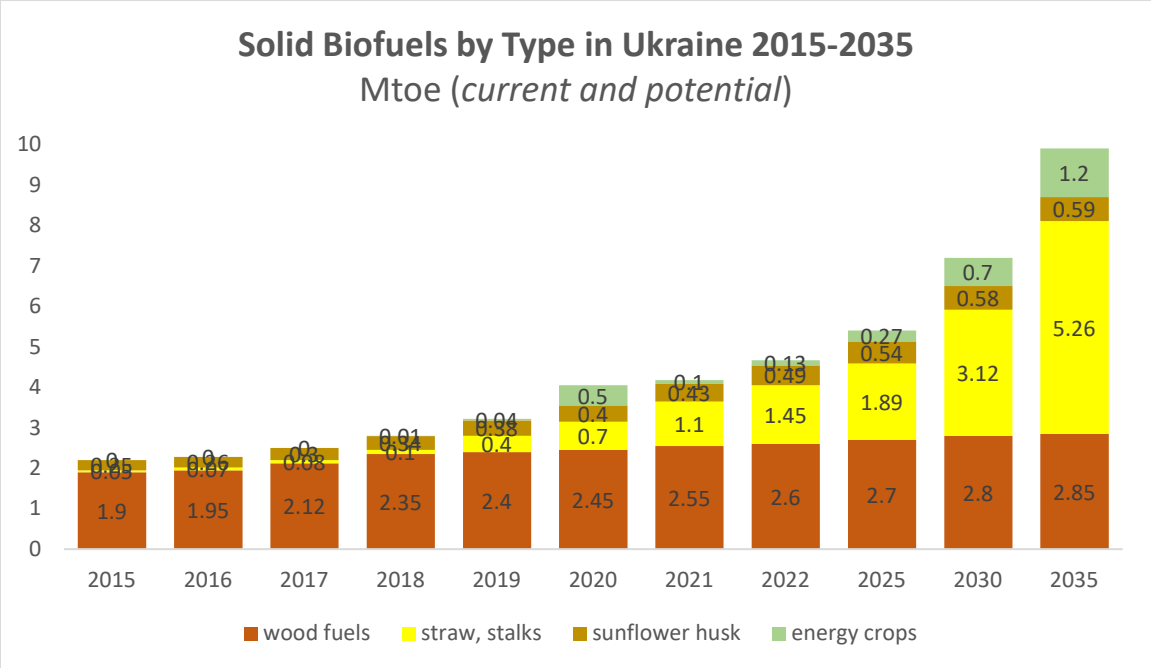
Exhibit 8 below shows in a table followed by a graph the Bioenergy Association's projections of the potential role of different types of solid biomass in Ukraine going forward. They show that the largest category in 2035 projections and the largest growth segment from the present by far is "straw and stalks." This further suggests the project is on the right track in addressing agri-biomass. Another category of agri-biomass that is particularly popular now due to strong financial returns is sunflower husk. Yet, the projections show this category as having less growth potential than "straw and stalks." Where the

[6] These impacts will be discussed in Section 2.2 and especially in Exhibit 10, with a preview in this footnote: While there has not been clear replication of the specific category of the project's early-stage boilers demos (straw pellet boilers), there has been some limited realized bioenergy impact to date and some impact on the bioenergy pipeline, though a significant portion is wood rather than agri-biomass. Specifically, the project straw pellet boilers in Uman likely influenced the establishment in 2017 of a 500 kW sunflower husk boiler there. The Uman demos further, in combination with the project's facilitation of municipal loans, probably stimulated Uman's 5.1 MW over 7 biomass boiler projects encompassing both wood and sunflower husk, for which Uman took out a loan equivalent to USD 1 million in Sept. 2017. While the exact breakdown is not available, we estimate roughly half the 5.1 MW capacity to be wood and half sunflower husk. Zhytomyr hopes to implement wood biomass CHP on a large scale with a total of 39 MWth and 8 MW power, a plan that is believed to be partially attributed to the early impact of the project's straw pellet boiler demos as well as its later pipeline work.

project's decision making seems at odds with the Bioenergy Association's projections and analyses is that the Association believes that corn stalks will make up the greater share of the "straw and stalk" category, while straws associated with cereal grains, the lesser share. They believe that 70% of such cereal straw should be returned to the soil for fertilization. Further, their financial analysis of returns at present show that bales of both corn stalks and cereal straw rather than pellets of these are currently economically viable in Ukraine as fuel for bioenergy projects. Please see Exhibit 9 for results of the Association's financial analyses. The Association is said to have had these views (such as that corn stalks will be the majority of the "straw and stalk" category) even during the time when the project was designed and launched. Indeed, it seems these views are being borne out given the lack of replication of the project's straw pellet boilers and suggest the project may have been off-track in putting all of its "eggs in one basket," signing a contract of USD 1.5 million for straw pellet boilers early on in the project. It also probably reflects the project's limited involvement of bioenergy experts in its work and major decisions the first 3.5 years of the project, when it instead tended to recruit generalists for its work.

Exhibit 8. Potential Role of Different types of Solid Biomass in Ukraine Going Forward (Mtoe)

Type of biomass	2015	2016	2017	2018	2019	2020	2021	2022	2025	2030	2035
Wood fuels	1.90	1.95	2.12	2.35	2.40	2.45	2.55	2.60	2.70	2.80	2.85
Straw, stalks†	0.05	0.07	0.08	0.10	0.40	0.70	1.10	1.45	1.89	3.12	5.26
Sunflower husk	0.25	0.26	0.30	0.34	0.38	0.40	0.43	0.49	0.54	0.58	0.59
Energy crops	0.00	0.00	0.00	0.01	0.04	0.05	0.10	0.13	0.27	0.70	1.20
TOTAL, Mtoe	**2.20**	**2.28**	**2.50**	**2.80**	**3.22**	**3.60**	**4.18**	**4.67**	**5.40**	**7.20**	**9.90**



†Includes both straw from grains and stalk from corn. Bioenergy Association believes corn stalks will be the much greater contributor in this category. They believe 70% of the straw from gains should be left in the field for fertilizer, but the other 30% can be used.
Source: Bioenergy Association's Ms. Tetiana Zhelienzna, presentation in September 2019.

Decentralization: In addition to high natural gas prices, a second trend that can facilitate the adoption of municipal bioenergy for heating and hot water is decentralization, which gives municipalities greater control of their budgets. At the same time, starting in 2014, the fusion of small municipalities/ villages

into federations that can keep more of their tax monies collected has been allowed, further expanding the potential base of implementers of municipal bioenergy projects.

Exhibit 9. Attractiveness of Various Agri-Biomass Investments

Project	Investment	IRR	Simple Payback
Collection, baling, sale of wheat straw, maize stalks (20,000-35,000 t/hr)	€ 518,000	24.1%	4.1 years
Production and sale of pellets (5 t/hr)	€ 2.6 million	6% maize 36% sunflower husk	9.6 years maize 2.8 years sunflower husk
Boiler plant straw bales (10 MW)	€ 2.5 million	28%	3.4 years
Boiler plant maize stalk bales (10 MW)	€2.2 million	32%	3.1 years
Boiler plant sunflower husk pellets (10 MW)	€ 1.4 million	53%	1.9 years
CHP plant straw bales (6 MW + 18 MWth)	€ 23.1 million	17%	5.1 years
CHP plant maize stalk bales (6 MW + 18 MWth)	€ 16.2 million	26%	3.7 years
CHP plant sunflower husk pellets (6 MW+18 MWth)	€ 16.2 million	26%	3.6 years

Source: Bioenergy Association's Ms. Tetiana Zhelienzna, presentation in September 2019.

1.6 Stakeholders and Pilot Cities

The project has engaged a range of stakeholders. These are similar to those interviewed during the TE mission. First and foremost are the beneficiaries and potential beneficiaries -- the municipalities that the project hopes to encourage to adopt bioenergy installations. Municipal players may include the municipal enterprise responsible for providing heating services and certain institutions that are "off-grid" from district heating, such as hospitals and schools that may benefit directly from municipal biomass projects. Also included are all those benefiting from the heat provided by such systems. At the municipal level, stakeholders further include private sector entities that may wish to invest in municipal bioenergy projects and sell heat to customers. Stakeholders also include banks and the financial sector that may get involved in loans for such projects. They also include a range of service providers to such projects, namely consultants that prepare feasibility studies and design and construction companies that carry out subsequent steps in the project process. National level and oblast (regional) level government stakeholders are also significant. As has been discussed, at the national level, SAEE is probably the most relevant organization and, within Parliament, the Energy Committee is the most relevant.

In the first phase of the project (first 3.5 years, around mid-2014 to early 2018), six cities received investment support. Pilot cities that received Avers supplied straw pellet biomass boilers and installation support at a cost of USD129,000 in GEF funds per boiler are: (1) Uman (2 at schools, 1 at a kindergarten, all off-grid, with USD 387,000 in total GEF funding); (2) Zhytomyr (4 boilers, 2 at a school, 1 at a kindergarten, and 1 at a university, all off-grid, with USD 516,000 in GEF funding); (3) Kyiv (3 at the National Ecological and Nature Center for Student Youth, all off-grid, with USD 387,000 in total funding). NGO grants of roughly USD 50,000 each supported planting of 5 ha of energy crop (willow) and some related activities, such as workshops, in each of the following cities: Poltava, Zakkarpatia, and Ivano-Frankivsk. It should be noted, however, that the three different NGOs receiving these grants were not from these cities, but instead each were headquartered in Lugansk Oblast.

During the second phase of the project (last 1.5 years, mid-2018 to end of 2019), 35 municipalities (some amalgamated federations of villages), broadly dispersed across the country, received support for feasibility studies (33 such studies) and/or technical design (19 designs), resulting in a pipeline of 48 projects. In some cases, more than one pipeline project per city was supported by feasibility studies or technical designs. Funding for feasibility studies was USD 5,000 per study (though in some cases more than one study per city was included in this fixed cost). Funding for technical design varied, though was in the range of USD 5,000 to 10,000 per design.

2. Project Overall: Relevance, Results/ Impacts, and Challenges/ Concerns

2.1 Relevance

The project as designed is highly relevant. This is true in its focus on solid agri-biomass, both in terms of what is practically needed to cut costs for Ukrainian cities and reduce their natural gas dependence in the long run and in terms of Ukraine's official renewable energy targets. It is further true in that the project aims to address an area not extensively addressed by other donors and that does not seem to be developing on its own without intervention, namely the area of agri-biomass within the municipal sector.

Evidence that the project's focus on solid agri-biomass use for heating and hot water in Ukraine's municipal sector is highly relevant is as follows: As discussed in Sub-section 1.5, heating and hot water accounts for a large share of energy use, as does the sub-category of municipal heating and hot water. Bioenergy, in turn, is highly relevant in the heating/ hot water segment, because of its high potential for replacing fossil fuels and reducing costs in this segment. As noted, solid biomass currently makes up about 80% of renewable energy use in the heating/ hot water segment in Ukraine and is projected in the long run to account for 70% of renewable energy in that segment. The TE team heard first-hand from municipal stakeholders of how bioenergy was either already reducing costs or expected to reduce costs by replacing natural gas in their heating and hot water supply. This replacement of natural gas (for which Ukraine has significant imports) also has benefits for the nation's energy security. The relevance of focus on the municipal sector is evidenced in that municipal heating/ hot water penetration by bioenergy is 3% (2019 expert estimate) compared to an overall penetration in heating/ hot water of about 6% (based on 2017 figure of 7.6% of heating being renewable energy and 80% of that being biomass). Indeed, stakeholders emphasized to the TE team that the uptake of biomass for heating had been highest in the industrial sector and that most of the examples of agri-biomass for heating that they knew of were similarly in the industrial sector. Looking at Ukraine's resources as well as biomass installations to date show the relevance of focusing on agri-biomass instead of woody biomass. So far, probably 90% of solid biomass capacity installed in recent years in Ukraine is wood. Yet, projections of potential by the Ukraine Bioenergy Association, as shown in Sub-section 1.5, suggests that in 2035, 54% of solid biomass will be the agri-biomass category of straw and stalks, as compared to just 3.5% in 2018.

While the foregoing shows the strong relevance of the project's design, implementation of the project during its first 3.5 years weakened its relevance. For example, the decision of the project in its first phase to focus heavily on straw and on one manufacturer of straw pellet boilers may have made it less relevant. As noted, the Bioenergy Association predicts that corn stalks will make up a much larger share of the straw and stalks category than cereal crop based straw. Corn stalks are more easily used in a range of boilers, whereas straw stalks require special, lower temperature boilers. In the area of straw, straw bales and straw briquettes may prove more cost effective for end users than pellets.

In terms of national targets, these call for strong growth in bioenergy in the national energy mix, showing the relevance of the project to national strategies. The *New Energy Strategy of Ukraine* targets a rise in share of the category of "biomass, biofuels, and waste" from 2.1% of primary energy in 2015 to 11% of primary energy in 2035. The *New Energy Strategy* further targets 24,000 MW of renewable energy based heat production as compared to around 2,800 MW today. Based on expert input that the 2035 figure will be about 70% biomass, targeted biomass heat production capacity in 2035 would be about 16,800 MW as compared to 2,265 MW today, or 7.4 times its current value.

In terms of other donors, the project is addressing a space that lacks sufficient support and is assessed by the TE team to need intervention to make progress. The TE team found that the IFIs, while having some activity in biomass in Ukraine, have mainly supported solid biomass projects in the industrial sector and mainly wood-based projects. Just recently (past few years) they are beginning to support municipal projects and agri-biomass-based projects. In fact, as will be discussed below, it is possible, to some extent, that awareness building of the *Ukraine Bioenergy Project* in terms of biomass may have had an influence in at least one city (Zhytomyr) that has led to negotiations regarding large budget IFI solid biomass projects. And, generally, it is understood that in Ukraine it is often feasibility studies supported by UNDP, GIZ, and other non-IFI donor projects that end up gaining investment for implementation from IFIs. In terms of concurrent overlap, the donor project that may have had the strongest similarities to the *Ukraine Municipal Bioenergy Project* is the USAID *Municipal Energy Reform Project in Ukraine*, which closed in 2017. This was a much broader project than the UNDP-GEF project being evaluated. Yet, it had strong municipal biomass and even agri-biomass components. Its work included feasibility studies for natural gas replacement by biomass for eight cities and agri-biomass potential studies for seven regions. Indeed, it seems there could have been good benefits of the two projects cooperating and coordinating their work, though no such coordination appears to have taken place. Nevertheless, the USAID project's work was limited enough that it can be concluded that sufficient support for municipal agri-biomass was not available and that the *Ukraine Municipal Bioenergy Project* was thus well-placed to fill an unmet need. As evidence: In comparison to the USAID project's eight feasibility studies for municipal biomass boilers in general, the *Ukraine Municipal Bioenergy Project* has supported 33 feasibility studies and 19 detailed designs for municipalities; and almost all of these have been for agri-biomass in particular. (Those that are not have been for energy willow, an energy crop, rather than other non-crop woody biomass.) As further evidence of the need for the *Ukraine Municipal Bioenergy Project* in the space of donor activities, EBRD has recently (3rd quarter of 2019) launched *Ukraine Sustainable Bioenergy Value Chain Innovations Program* with GEF. This program, while focusing on agricultural residues, will work with the agricultural/ industrial sector, rather than municipalities.

2.2 Most Notable Results and Impacts

While results will be covered component by component in subsequent sections, here we highlight the most significant results and impacts or potential impacts down the line:

Large pipeline of bioenergy projects developed in last 1.5 years of project: First and most important, the project has in its last 1.5 years developed a large pipeline of municipal agri-bioenergy projects via support of 33 feasibility studies (some covering more than one project) and 19 detailed technical designs, some quite large in scale. In the process of doing so, they have raised the awareness and knowledge base of the 35 municipalities involved about bioenergy through close interaction with the project's biomass roster of consultants and have completed groundwork for bioenergy projects across these cities. The potential for broad (across the country) and ongoing impact in coming years with implementation of these projects and replication of them is quite high. The total number of projects directly supported (given that five overlap having both feasibility study and technical design supported by the project) is 48. The

majority are municipal biomass boiler for heating only projects, though there is also a very large CHP project, some agri-biomass briquette production projects, and some energy crops projects.

The *Ukraine Bioenergy Project* has worked hard to ensure this support is not just resulting in "studies on the shelf." Because strategy of the project was off-course at first and this shift was not made until late in the project (i.e. last 1.5 years), it is still too early to achieve full confirmation of financing and implementation of many of these projects. In this regard, it should be noted that there were two rounds for applications from cities, the first round selections were made in October 2018 (just 14 months before project close) and the second round closed only on August 1, 2019, so just five months before project close. Yet, the signs are good that many of the pipeline projects will come to fruition. Currently, 13 (or about 27%) are fully confirmed, either having been implemented (2 projects), or with confirmed financing for implementation (11 projects, that we thus consider to have 95% likelihood to be implemented). As for the others, the bioenergy consultants on the project roster have worked closely with their respectively assigned municipalities to ensure financial viability of the projects and to encourage the municipalities in their search for financing. Based on interviews and explanations of financial viability, municipal interest, and efforts underway to get their projects funded, the TE team believes that more of the projects will be implemented in the coming few years. Assigning rough probabilities, eight are rated 75% probable to be implemented the next few years, three at 50% probable, three more at 35% probable, and then the remaining 21 are given just 20% probability to be implemented. Using these probabilities as weightings, it is estimated that roughly 26 of the 48 projects, or 54% will be implemented in the next few years or at latest by 2023. Sources of potential funding include municipal budgets, the private sector, bank loans, and IFIs, with the first three categories already being realized among the projects fully confirmed for implementation. With this level of 54% implementation of pipeline projects within reach, direct GHG ER targets of the project are likely to be roughly achieved, but with much of this achievement in the form of direct post-project ERs – those achieved from installations directly influenced by the project, but installed and commissioned after project close.

With regard to these pipeline projects, also quite notable is that the project has developed a means of supporting not only feasibility studies but also the detailed technical design that follows them and is required before implementation. Some stakeholders not involved in the last phase of the project indicated that donor projects cannot support detailed technical design and that feasibility studies usually just sit on the shelf. Yet, the project developed a means of supporting technical design. And, those projects with technical design carried out are considered the most likely to be implemented. Once technical design is carried out, the municipality has already committed effort and resources to preparing a TOR and putting the project in its plan, so is more likely to follow through. The project's approach in supporting technical design is covered in the relevant results section of this report. It is a kind of innovation that future projects that hope to stimulate investments via TA support should consider. At the same time, for engaged, proactive municipalities, the feasibility studies are also of strong value in stimulating real projects. And, as noted, IFIs look to the feasibility studies prepared by UNDP and other non-IFI donors for potential future projects, rather than supporting a lot of such feasibility studies themselves. Thus, for the largest project in the pipeline, namely the CHP project in a suburb of Kupensk in Kharkiv Oblast, while much more challenging to get financed from the municipal budget and loans, may actually have a good chance of being financed by an IFI, such as EBRD, which does not finance projects of less than €5 million in project value in Ukraine.

Enabling of relaunch of municipal bank loans in Ukraine: The financial support mechanism ("FSM") work of the project has had substantial success in achieving the reintroduction of municipal loans into Ukraine, where none had been possible before. This was achieved by influencing and providing the necessary support for the Central Bank and Ministry of Finance to adjust policies for municipal loans and by building interest and capacity among domestic banks in this area. In the long run, it is expected the development will be particularly important for mid-sized and small cities, who previously did not have

much access to financing outside of their municipal budgets. Before the changes made possible by the project, bond issuance to large cities was a means by which banks helped provide financing to them, though even large cities were not able to take out bank loans at that time.

Data from 2016 through the end of October 2019, shows that 21 municipal loans have been made during this period by domestic banks in Ukraine to nine different cities. (Please see Exhibit 13 later in this report.) There were no such loans in 2016, one in Dec. 2017, eleven in 2018, and nine in 2019 until end of October, thus showing correlation with the work of the project to restart municipal lending. At present, most of these loans are going to the larger cities (e.g. population over 700,000) rather than the small or medium sized ones, probably because the large cities have secure and quite substantial cash flows and are less concerned about the high interest rates that have been common in Ukraine the past several years. (Interest rates for the 21 municipal loans during the period ranged from 17.4% to 19.5%.) Yet, six of the loans went to smaller cities with three going to Ivano-Frankivsk (with population of about 230,000, and with about USD 4 million for each of the loans), one going to Vinnytsia (with population of about 370,000, with loan of about USD 10 million), one to Melitopil (with population of about 154,000, will loan of about USD 2 million) and, of special interest due to the city's small size, one going to Uman (population about 83,000, for about USD 1 million).

Only one of these loans was for municipal biomass boilers, the loan of about USD 1 million to the city of Uman, which notably was one of the three cities included in the project's early biomass boiler demos. Despite limited impact in the municipal biomass sector to date, this achievement of the project in facilitation of the municipal loan market is expected to have far-reaching impact, achieving something that would not have happened on the same timescale without the project. While the benefits may be mostly outside the realm of biomass boilers at present, the stage is now set for a substantial uptick in municipal loans for all kinds of infrastructure. What is now needed as a next step is to remove barriers to more small and medium-sized cities getting such loans and increase the number of municipal bioenergy loans. Once loans become more attractive to small and medium-sized cities, there is a good chance there will be an uptick in bioenergy municipal loans. In the past, due to the high "Green Tariff" (i.e. feed-in tariff), PV and wind have been very attractive investments in the renewable energy space in Ukraine. Yet, as the high tariffs have put a strain on the state budget, the Governments has decide to switch from the Green Tariff to a competitive auction approach for wind and PV power projects. Some believe the competition will drive the power purchase price down, thus making PV and wind less attractive than before as investments in Ukraine, while the price of gas is going up, making biomass more attractive. This shift in dynamics may drive more "green" investment and loan money towards biomass heating projects. UkrGasBank, the top bank in terms of municipal loans and one that also has a special ecological loan section, is planning to focus on biomass. They are said to be hiring a special manager for this purpose.

Change of mindset of municipalities, leading to substantial and serious bioenergy pipeline in certain cities, especially Zhytomyr, Odessa, and Uman: While more difficult to definitively prove, findings suggest the project has had impact on mindset in certain cities, which has resulted in (or at least, along with other factors, significantly contributed to) those cities pursuing more extensive investment in bioenergy projects or at minimum developing a serious, long-term vision for such investment. The cases of Zhytomyr, Odessa, and Uman are considered especially compelling, given the extent of and seriousness about potential bioenergy investments. This sub-sub-section presents findings on mindset and pipeline/vision for five municipalities and one federation of villages. Among these, the cities of Uman and Zhytomyr represent two of the three locales[7] of the project's early straw pellet boiler installations (the other being the Nature Center in Kyiv), received substantial project investment for these early installations, and are now receiving support (in much lower dollar amounts) for feasibility studies and technical design. The other four cities/federation included as examples in this sub-sub-section are only

[7] A fourth location of the early boiler installations, in Donetsk Oblast, was quite delayed in startup.

getting the much lower level of support from the project's later phase, some having also been influenced by the project's study tour, but are also good examples of project impact.

The impacts on mindset and municipal thinking about long term plans for bioenergy likely span more than just the six examples given here. Four of the six example locales (Uman, Zhytomyr, Odessa, and Palanka Federation) represent all four of the locales outside of Kyiv visited by the TE team during its mission. As all appear to have been substantially impacted, this is a "four-out-of-four" impact rate. Two other municipalities that the TE team happened to hear about in interviews (a Kupensk suburb and Vonznesensk) are included. Yet, as 35 cities have proactively applied for support for feasibility studies and/or detailed technical design and are receiving support, based on the "impact rate" among places visited during the TE mission, it is likely the impact on municipal mindset and planning/vision is much wider than covered in these six examples.

Zhytomyr Municipality, Zhytomyr Oblast: The municipality of Zhytomyr, which has a population of about 266,000, benefitted from four, off-grid straw pellet boilers (each 220 kW) procured in the early phase of the project (and fully covered by project funds) and later (in 2019) from design support for a 2 MW off-grid agro-pellet boiler project. The TE team was quite impressed to learn that Zhytomyr's Municipal Enterprise has a vision of transforming the city's district heating system to a majority biomass supplied system by working with IFIs to implement major bioenergy projects. Their target is that 95% of heating on average is supplied by bioenergy. The city's vision includes three major CHP bioenergy projects that may be supported by EBRD and SECO. The three projects, if implemented, would have a total heating capacity of 39 MWth and total power generation capacity of 8.4 MW. The plan is that the fuel would be wood, which admittedly is not in line with the *Ukraine Bioenergy Project's* focus on agri-biomass. Straw was considered initially by Zhytomyr for this major transformation of its district heating system, but the logistics were deemed to be too difficult. While economics, namely the savings in fuel costs, are said to be driving pursuit of these very large bioenergy projects, feedback obtained by the TE team from sources with access at a very high level to city leadership confirmed that Zhytomyr's biomass plans have been influenced by the UNDP-GEF project. Findings suggest that a grant of € 4 million has already been secured for this work from SECO. One source explained that Zhytomyr was chosen for the SECO grant because of its biomass experience with the UNDP-GEF project. Indeed, it was the city that proposed doing biomass under SECO grant, something it is said to have been inspired to do because of its earlier experience with the UNDP-GEF project and recent support for design of the 2 MW project, the latter giving the city confidence in doing a larger scale project. Now that it has had these off-grid experiences, it is ready to move to on-grid – to its district heating system – with bioenergy. While Zhytomyr is looking at using wood fuel in these larger district heating projects, stakeholders explain that getting familiar with the logistics of biomass boilers (e.g. bringing in fuel supply) with the UNDP-GEF demos was helpful to them in getting familiar with and confident in the process so that they can now do it at larger scale. A target of supplying 95% of the city's heating by biomass is indeed quite astonishing. The TE team has heard that there are two other cities in Ukraine looking at such major transformations of their heating systems to biomass, though no clear links to the project in the case of the two other cities are known.

Odessa Municipality, Odessa Oblast: In Odessa, the project has supported detailed technical designs for a 4.5 MW off-grid sunflower husk pellet boiler at a hospital and is supporting an additional two agro-pellet boiler designs (a 2.5 MW one for a hospital and a 700 kW one for a school) in its second round, which as noted closed to applications only on Aug. 1, 2019. While the private company financing the 4.5 MW boiler had already previously completed one other such project, having been motivated by its high profitability, findings suggest that the municipality of Odessa, by being involved in the UNDP-GEF project, has been influenced to plan and pursue a number of other projects. The city is hoping to institute biomass boilers in a number of other off-grid locations. Further, after they finish energy efficiency retrofitting work underway, they would like to address the supply side of their district heating by instituting a 16 to 20 MWth CHP project. Odessa stakeholders saw a bioenergy CHP facility during the

UNDP-GEF project's study tour and indicate this is definitely what influenced them to want to do CHP. They have now included the proposed CHP project in their investment promotion materials. In addition, four satellite cities of Odessa, according to municipal sources, are also now interested in pursuing bioenergy CHP facilities.

Exhibit 10. Influence of Project in Mindset Change of Municipalities Leading to Substantial Bioenergy Pipeline/Vision – Input from Stakeholders

City	New Plans/ Pipeline and Status (*Notes on project-supported efforts in italics*)	Role of *Ukraine Bioenergy Project* in Influencing New Plans/ Pipeline as Indicated by Sources and/or Implied by other Evidence
Zhytomyr	-Pursing 3 wood pellet CHP installations for district heating with total of 39 MWth, 8.4 MW power to achieve average of 95% of heating from biomass. Has secured €4 million from SECO also discussing with EBRD. *Note: 2.1 MW off-grid agro-pellet boiler for which design was supported by UNDP-GEF project is expected to be under operation soon. Four earlier 220 kW straw pellet boilers procured fully by project in operation.*	-Multiple sources indicate city at highest levels influenced in their bioenergy plans by UNDP-GEF project. -Sources indicate it was city's idea (built on UNDP-GEF experience) to pursue SECO grant and it was because of this experience that city was selected. -UNDP-GEF project got city familiar and comfortable with fuel logistics needed for bioenergy projects. -4 UNDP-GEF supported straw pellet boilers followed in 2019 by design support for 2.1 MW off-grid agri-pellet boiler. Sources indicate these off-grid experiences certainly built the confidence and interest in pursuing bioenergy in district heating.
Odessa	-Interested in pursuing several additional off-grid biomass boilers. -Long-term would like to pursue biomass district heating CHP project of 16 to 20 MWth; and its 4 satellite cities are also interested in CHP. Has advertised CHP project in its outreach to foreign investors. *Note:3 off-grid boiler project designs supported by UNDP-GEF project, one already operational.*	-Odessa stakeholders saw a bioenergy CHP facility during the UNDP-GEF project's study tour and indicate this is definitely what influenced them to want to do CHP. -Project supported design of 3 off-grid boiler projects (1 sunflower husk, 2 agro-pellets), one operational the other two likely to be implemented by end of 2020. TE team guesses this activity has influenced city in its aspiration for additional off-grid projects and also, in addition to study tour, CHP.
Uman	-500 kW sunflower husk boiler project in 2017 -Loan for about USD 1 million in 2018 for seven biomass boilers (to use sunflower husk and wood) *Note: 5 feasibility studies and 2 technical designs during last phase of UNDP-GEF project for straw and sunflower husk boilers. Three earlier straw pellet boilers procured fully by UNDP-GEF Project operational.*	-Stakeholder indicates prior to UNDP-GEF straw pellet demos, "no one was talking about bioenergy," implying realization of sunflower husk project tied to experience with UNDP-GEF project. -Municipal loans made possible again by UNDP-GEF project. Also, given promotion of bioenergy loans in particular by UNDP-GEF project, as well as previous support of Uman in bioenergy, TE team concludes the loan and seven associated boilers in large part due to UNDP-GEF project. -Uman's very active role in UNDP-GEF project's feasibility studies and designs (6 distinct projects in total) also believed by TE team to have been influenced by earlier work of UNDP-GEF project.
Palanka Federation	-Indicate they would like to use straw boilers in many other places and have 30 other potential sites. They'd like to do that over 10 years. They have no district heating – all is off-grid. *Note: Planning 3 straw briquette boilers, each 220 kW, with design and*	-Heard about UNDP-GEF project opportunity (for support of feasibility studies/ designs) from an agrarian businessman selling straw pellets in Uman -TE team notes Palanka is very proactive with regard to project-supported designs and believe its vision for 30 more agro-biomass boiler projects over next 10 years is highly influenced by the project.

	23% of investment supported by the UNDP-GEF Project.	
Kupensk suburb	-Spent USD 240,000 on technical design of straw bale CHP project -Mayor interested in energy crops (willow) in swamp area of city *Note: Feasibility study supported by last phase of UNDP-GEF project for the 20 MWth, 9 MW power CHP with straw bales (only the 3rd such one in country)*	-Persons from Harkiv Region (where this Kupensk suburb is) participated in domestic study tour and were reportedly greatly influenced by it. This is believed by TE team to have led both to the 20 MWth, 9 MW CHP feasibility study under the UNDP-GEF project (which in turn led to the USD 240,000 spent by the municipality of detailed design) and the mayor's idea of doing energy crops in the city's swamp area.
Vonznesensk	*Note: Vonznesensk was supported by the Bioenergy Project in feasibility studies and corresponding designs for two 350 kW straw briquette boiler projects. While these activities do not go beyond the project, as explained to the right, TE team found mindset change and decision for involvement in feasibility study/design competition partly attributable to early project demos and study tour.*	-Mayor happened to drive by straw pellet boiler in Uman that was procured by project and then, with help of project, visited the schools' director. Mayor became interested and then joined the project's study tour. This eventually led to Vonznesensk carrying out feasibility studies and design under *Bioenergy Project* for two boiler projects. TE team believes the mayor's mindset was influenced by exposure to the early project demos and by participation in the study tour, thus leading to Vonznesenk's enthusiastic participation in the project

Uman Municipality, Cherkasy Oblast: The project provided full funds for procurement and installation of three straw pellet boilers in the city of Uman, which has a population of about 83,000. Stakeholders in Uman explained that, prior to the project demos there, no one in the city was talking about biomass boilers. Yet, after the project demos were installed, the city in 2017 installed a larger boiler of 500 kW (the project demos had been 220 kW each) that uses sunflower husk as feedstock. The boiler (unlike the straw pellet boilers) is said to be "universal" meaning it can handle wood, sunflower husk, and corn feedstock. As noted, Uman also took out a loan in 2018 of about USD 1 million for biomass boilers. Seven such boilers were included in the plan; and the feedstocks are indicated to be wood and sunflower husk. The possibility of the municipal loan, as discussed above, is strongly tied to the project. The TE team guesses that the 2017 sunflower husk boiler project and the interest in carrying out more bioenergy projects under the loan were both also strongly tied to Uman's experience with the *Ukraine Bioenergy Project*. Uman has also been particularly active in the pipeline of projects the *Bioenergy Project* has developed during its last 1.5 years, with four feasibility studies supported and two technical designs (one overlapping with one of the feasibility studies) for a total of five boiler projects ranging in capacity from 100 to 400 kW. These are indicated to use straw pellets or sunflower husk.

Palanka Federation, Cherkasy Oblast: Palanka is a federation of about nine villages in Uman Rayon. Total population is about 9,000 persons. Interestingly, Palanka heard about the opportunity to get support from the UNDP-GEF project for feasibility studies/ designs from a local agro-business person who supplies the project-supported demos in Uman Municipality with straw pellets. Palanka has carried out design of three 220 kW straw briquette boilers with project support. Two of these boiler designs already have construction permits and are expected to be operational by the end of 2019, while the other one is expected to be operational by end of 2020. The TE team noticed that the Federation has been very proactive about moving its straw briquette boiler projects forward. About wider impact, the topic of this sub-sub-section, the TE team understands that Palanka has a long-term vision of converting many other sites to biomass and believes this is influenced by the project, which is supporting Palanka in introducing its first bioenergy boilers. Palanka has identified about 30 other boiler sites that they would like to convert to biomass over the next ten years. As these are villages, there is no district heating – all are "off-grid" sites.

Suburb of Kupensk Municipality, Kharkiv Oblast: As a specific example of impact of the study tour, persons from Kharkiv Region participated in the project's domestic study tour. A suburb of the Region's Kupensk Municipality has since applied for support from the *Bioenergy Project*; and a feasibility study for a 20 MWth, 9 MW power CHP project in Kupensk City using straw bales has been prepared. The suburb has since spent USD 240,000 to do detailed design for this project. If implemented, this would be only the third such large straw bales CHP project in the country. The mayor is said also to be interested in planting energy crops (willow plantation) in a swamp areas the city has. The TE team believes these activities and interests are strongly linked to Kharkiv's involvement in the *Bioenergy Project's* study tour.

Vonznesensk Municipality, Mykolaiv Oblast: Another story of impact and mindset change involves the city of Voznesensk. A stakeholder related the story that the mayor of the city, sometime after having preliminary discussions with the project about analyzing the feasibility of using biomass boilers in schools, was driving through Uman and noticed a biomass boiler near a school. The mayor checked with the *Bioenergy Project*; and, as it turns out, this was one of the UNDP-GEF supported boilers. The *Bioenergy Project* connected the mayor with the school's director, so that the mayor was able to visit the school the same day. The mayor was impressed by the results and thus decided to join the project's study tour in March 2019. After the study tour, the project completed feasibility studies for straw briquette boilers of 350 kW each for two schools in Voznesensk and eventually also supported the detailed technical design for these boilers.

Benefits to and impacts on next generation: The project's support of biomass boilers (initially as "pilots" procured fully by the project and later as TA support for feasibility studies and technical designs of boiler projects) benefits and impacts the next generation. Several of the "pilot" installed boilers are in schools; and many of the pipeline ones are targeted for schools as well. While in many cases the boilers will cut total heating expenditures for the schools, the TE team noticed in some cases (particularly a kindergarten visited in Zhytomyr), the school may opt to reduce total savings in favor of keeping the school warmer than before, thus raising the comfort level for students. Biomass boilers in schools present an opportunity for students to observe and understand about biomass as an alternative heating fuel. The three straw pellet boilers procured and installed by the project at the National Ecology and Nature Center in Kyiv may have the potential to reach the greatest number of students. Every year, thousands of students visit the center, which organizes biological and environmental training, and is said to introduce the straw pellet boilers to its many visitors.

Impact on government thinking and future donor work in Ukraine: An interesting impact of the project is evidenced in that MENR has told BMU (German Department of Environment) that their preferred renewable energy area for donor support is biomass. BMU is planning a seven-year project of support in Ukraine, comprised of four components. Three of the components are cross-cutting, but the only one in a specific renewable energy area is the biomass one, which will be supported with around € 7 million. The way this came to be is that BMU consulted their counterpart, MENR, carrying out interviews and consultations, to identify priority areas. As part of this, they talked to the Biomass Working Group, organized under MENR with the support of the *Ukraine Bioenergy Project*. Stakeholders suggest that it is certain that the *Bioenergy Project* had an influence on BMU's selecting bioenergy as an area of focus. Another related result is that GIZ has selected UNDP and a key partner in the *Ukraine Bioenergy Project*'s second phase, the Ukraine Bioenergy Association, to bid together with GIZ as a consortium on BMU's planned bioenergy component.

2.3 Most Notable Challenges, Concerns, and Shortcomings

While the project shows a high degree of relevance in its area of focus and design, the project as implemented during its first 3.5 years showed a strong risk of losing its relevance by lack of focus on its

targeted objective-level and outcome-level results. As an example, the project during this period hired 12 different policy consultants, most of whom were reportedly working on different aspects of policy, in hopes that some of their many initiatives would come to fruition. While this was explained as a risk mitigation approach (like investing in index funds in the stock market), it shows the project's lack of focus on what is really important to achieving project objectives and outcomes.

Other major concerns about the project, particularly as implemented in the first 3.5 years, are as follows:

- The project in its first 3.5 years did not recruit persons with expertise in bioenergy and instead encouraged generalists to apply for consultancies. It appears the project did not reach out to and did not encourage those with the relevant expertise to apply to positions.
- During the first part of the project, the GEF funds slated for investment were not used strategically. Instead, as has been noted, there was a USD 1.5 million contract with a supplier to provide a type of straw pellet biomass boiler that appears to have had low probability of replication due to costs. In fact, despite the high investment, no replications have been verified, though there may be a few installations outside of the municipal sector. Further, while the project design emphasized support of feasibility studies and maximum 25% grant for installations in order to really leverage GEF funds and demonstrate financial viability, the project in its first phase slated this USD 1.5 million in GEF funds for 100% support of biomass boiler procurement and installation costs. Municipalities are indicated to have provided limited co-financing (e.g. up to 15%) for cement bases, etc.
- The first part of the project also showed a lack of cost effectiveness. The two prime examples are the USD 1.5 million boiler contract mentioned above and a large awareness contract. Evidence suggests the boiler contract may have been twice the price it should have been. The awareness contract, for around USD 750,000, which was mainly about materials preparation and training, likely could have been provided for a third of the cost had the TOR preparation and outreach to potential bidders been conducted in a more strategic fashion. Even so, the large number of trainings (338) seems excessive, so that an even smaller contract size resulting from fewer trainings would have made sense.
    - Attempts were made to charge the large awareness contract to the project's investment/ financial mechanism component, instead of the awareness component, which lacked enough funds to cover such a large contract. In the end, this contract was cancelled, but UNDP still had to pay the vendor about USD 235,000 for work completed and compensation. The TE team considers it a success of UNDP QA that the problem with this contract was caught and dealt with, though valuable time and resources were lost dealing with this issue.
- The project faced major challenges due to the country situation, but instead of using adaptive management to find new and innovative ways to address project aims, the team in the first 3.5 years of the project seemed to declare the aims untenable and instead tried to spend resources on "easy" activities such as procurement of boilers fully paid for by the project or the aforementioned atypically large awareness contract. Some of the challenges due to the country situation that project faced vis-à-vis its targeted results were: high interest rates (so that domestic bank loans in support of municipal bioenergy projects were not an attractive option, thus making the path to success for the project's "financial support mechanism" unclear), lack of funding in municipalities to implement bioenergy projects (thus making the project's target of maximum 25% grant for such projects seem untenable), and seeming impossibility of a government agency setting up a biomass support unit due to lack of funds (thus making the "biomass support unit" target seem impossible). Yet, as will be discussed in the component by component result analyses later in this document, for each of these challenges, more innovative, flexible means of addressing the project's targeted results could have been adopted, rather than falling back on "easy" activities that did not move the project towards targeted results.
- The project during its first phase focused on sub-optimal government partners. Even at the time of launch of the project, SAEE would have been the strongest government partner for achieving policies to promote biomass and for reaching out to municipalities to encourage them to implement bioenergy

projects. Yet, the project first tried to work with Ministry of Agriculture and then put the most focus on MENR, before finally shifting to SAEE when the team changed, for the last 1.5 years of the project. An earlier focus on SAEE may have increased the results achieved.

- Decision-making and oversight functions were flawed. The project's oversight body, the Project Board, seems ad hoc without a clear decision-making process or clear guidelines for membership. (Please see Sub-section 1.4.) Further, the project in its early phase did not respect the oversight role of UNDP-GEF, namely of the RTA in approving major changes in the budget.

2.4 Relevance and Impacts vis-à-vis UNDP Priorities and Country Programming

The *Municipal Bioenergy Project* is found to be highly relevant to UNDP priorities and country programming, as well as a good fit with UNDP's comparative advantage. The points below are the evidence in support of this conclusion:

UNDP's *Strategic Plan* calls for "accelerating structural transformations for sustainable development." For the *Bioenergy Project*, the relevant output is "Solutions developed, financed, and applied at scale for energy efficiency and transformation to clean energy and zero-carbon development, for poverty eradication and structural transformation" as measured by "investment leveraged, solutions applied at scale, and growth in power generation from clean energy." The project in its work the last 1.5 years is highly relevant to this output in its promoting biomass in municipal heating and power generation as a part of the transformation to clean energy and zero-carbon development. The feasibility studies and detailed designs developed are leveraging a lot more investment than was put in by the project. Further, it is expected that installations resulting will be replicated widely, thus leveraging further investment and scale-up of municipal bioenergy. Finally, in terms of power generation from clean energy, while heat and hot water supply have been the main application area of focus, the *Ukraine Municipal Bioenergy Project* has supported feasibility study and design for a major bioenergy CHP project, which by definition includes not only bioenergy heat provision, but also bioenergy-based power production.

UNDP's *Country Program Document for Ukraine* and the *UN Development Assistance Framework for Ukraine* targets that "By 2022, national institutions, private businesses, and communities implement gender-responsive policies and practices to achieve sustainable management of natural resources, preservation of ecosystems, mitigation and adaptation to climate change, and generation of green jobs." The output relevant to the *Bioenergy Project* is "Local authorities and communities adopt gender-responsive and sustainable solutions for increased energy efficiency and modern energy access, especially of renewable energy" as measured by number of new renewable generation sites and number of public spaces and buildings with improved levels of energy efficiency in target municipalities. The *Ukraine Bioenergy Project* is highly relevant to this output. By developing a large pipeline of bioenergy projects, many with a strong likelihood of implementation, the project contributes to the targets of increasing the number of installations ("new renewable generation sites") and buildings supported by clean energy.

In terms of the *UN Strategy Development Goals* (SDGs), the *Ukraine Bioenergy Project* is highly relevant to SDG 7 "Ensure access to affordable, reliable, sustainable and modern energy for all," addressing the two targets: (i) "7.1 By 2030, ensure universal access to affordable, reliable, and modern energy services." (ii) "7.2 By 2030, increase substantially the share of renewable energy in the global power mix." The pipeline project developed by the *Ukraine Municipal Bioenergy Project* in the area of bioenergy CHP and its potential replication, as well as the project study tour's influence on Odessa in pursuing bioenergy CHP, is clearly linked to SDG target 7.2 by potentially raising the share of renewable energy in the global power mix. As for target 7.1, while the project is not providing energy in the form of heating (and sometimes electricity) where there was no access to energy before, it is contributing towards

making energy more affordable and more modern in Ukraine's municipalities. Indeed, residential gas prices, which have been highly subsidized in the past, are rising in Ukraine. For off-grid heating systems, bioenergy allows institutions to save money by lowering their fuel costs. For on-grid systems, the savings may go to the municipality, but may also be passed on to consumers.

In terms of UNDP's comparative advantage, the *Ukraine Municipal Bioenergy Project* is an extremely good fit. First, the focus on agri-bioenergy for municipalities is a very good fit for UNDP. As mentioned, this is an area that is not getting much focus, as others look to more easily realized opportunities in the industrial / agricultural sector. And, even if the municipal focus is not considered, having the first extensive donor project focusing exclusively on agri-biomass (aside from some earlier, more limited demonstrations, such as straw bale boilers by USAID around 2009), UNDP opens up a new area, carrying out "experiments" and innovations of sorts, which is one of its strengths --- opening up new areas in which other donors may then join. Similarly, the *Ukraine Municipal Bioenergy Project's* current focus on feasibility studies and detailed technical designs is also suitable to UNDP's comparative advantage of starting new things in which, in the case of its designs for larger projects, such as the Kupensk suburb CHP project, IFIs may later get engaged when it comes to full financing. Further, the *Ukraine Municipal Bioenergy Project* addresses mostly smaller scale investments, whereas the IFIs tend to focus on larger projects. An example, as noted, is that EBRD focuses on projects with over USD 5 million in investment. It's important to address the smaller scale boiler projects, particularly for smaller municipalities and federations of villages where they may be common. Lastly, the *Ukraine Municipal Bioenergy Project* adopts a multi-pronged strategy of addressing the complementary areas of (a) policy/ planning; (b) institutions; (c) investments, demos, and financing; and (c) awareness. Though the project has faced challenges in some of these areas, this multi-pronged approach and particularly integration of policy/ planning, institutional work, and awareness work with demonstration and investment/ financing work is UNDP's comparative advantage. This is as compared to other donors that may focus more exclusively on the investments and the financing area.

3. Component 3 Results/ Effectiveness Part 1: Investment/Installation - Bioenergy Feasibility Studies, Design, and Installation

This section of the report is the first of six sections covering results component by component. Component 3, the "investment and installation" component, is covered first and separated into three sections, given the large amount of content. Components 1, 2 and 4 are then covered in one section each. We begin with Component 3, because of its importance and prominence among project activities and expenditures. And, among the three sections of Component 3, we begin with this section covering the project's municipal agro-bioenergy feasibility study and technical design work. This has been the project's main focus over its last 1.5 years; and we consider it the most important and impactful work of the project. It includes 48 distinct projects via the 33 feasibility studies and 19 technical designs (with some overlap of projects among the two types of support) and support for 35 different municipalities and village federations. Four of the projects have received partial grant support for equipment and installation (limited to 30% of total investment in three of the four cases).

Section 2.2 of this report ("Most Notable Results and Impacts") has introduced the big picture significance of the project's feasibility study and design work. A key point is that evidence from interviews, field visits, and documentation suggests the project has created an active pipeline of projects that is moving forward, with some of the projects already implemented and many likely to be

implemented in the coming few years. It, thus, has been successful in avoiding the problem of "reports sitting on shelves" and has done so by its methods of: (a) only providing support for feasibility studies and designs when proactively applied for by cities; (b) actively engaging municipalities in the process of feasibility study and design as true "clients" of the project's roster of bioenergy consultants; and (c) emphasizing financial analysis and financial viability of investments in interactions between the consultants and client municipalities. Another important aspect of the strategy to ensure a "live" pipeline is the project's support of detailed technical design work. This is not so common among donor projects in Ukraine. There is perception among some stakeholders that donor projects cannot support technical design, but the *Ukraine Municipal Bioenergy Project* has clearly found a way to do this. A completed detailed design reflects more substantial buy-in of the municipality than the feasibility study does, as municipalities must prepare and approve the design TOR and recruit a design company to do the work. Support for detailed design removes one of the key, final barriers before implementation, thus strengthening the probability of implementation of supported projects.

The approach of supporting feasibility studies and technical designs is highly cost effective. The allocation for the feasibility studies is USD 5,000 per study. There were 33 studies completed, though in a number of cases, the USD 5,000 fees included more than one feasibility study for the client municipality. In all, an estimated 29 units of USD 5,000 was paid for feasibility studies totaling USD 145,000. The price of the detailed design varies, though is roughly USD 10,000 per design including payment to the design company and oversight by the project's bioenergy roster consultants responsible for design. With 19 designs carried out, this cost is around USD 190,000. Thus, total costs for feasibility studies and designs are about USD 335,000. In addition, the last phase of the project provided grant support for equipment and installation to four of its pipeline project for a total of USD 223,174. Thus, total expenditures on this pipeline for the last phase of the project is just around USD 558,000, much less than the roughly USD 1.35 million spent on the 12 boiler procurements early in the project that have seen no municipal replication.

The main content or evidence of this section is provided in Exhibit 11, which lists the municipalities and the projects with support from the *Bioenergy Project* for feasibility studies or designs. It shows the municipality, type of project with scale and fuel type, investment amount, projected lifetime GHG ERs, and our assessed likelihood for implementation, with explanation as relevant. The table arranges the projects into color-coded groups based on assessed likelihood for implementation. Totals for installed capacity, investment, and GHG ERs are provided towards the bottom of the table, followed by computation of these totals in a weighted fashion, based on probability that each project will be implemented. Exhibit 12 provides an overview of the projects as a group, as derived from the listings in Exhibit 11. Exhibit 12 shows the vast majority of pipeline projects are boiler projects and the most common feedstocks are sunflower husk pellets (9 projects) and straw briquettes (8 projects). The most common clustering of boiler sizes are in the less than 500 kW range (20 projects) and in the 1 to 5 MW range (14 projects). Forty-four percent of the projects are rated as having a relatively high chance of being realized (75% or better) and 60 percent in aggregate are considered to have a 50% chance or better.

The TE team is overall quite favorably impressed by the project pipeline work. In particular, interviews with the bioenergy roster consultants showed they had conducted in-depth analyses and were taking a comprehensive approach, with emphasis on financial viability of projects. It also appears that the process of this work was a means of educating the cities and building their capacity and knowledge base about bioenergy. Given that the project in its first 4 years did not generate the project pipeline it was meant to, the new team had quite a lot of pressure to deliver a project pipeline quickly through these feasibility studies and detailed technical designs. As such, they decided to focus mainly on this work and dropped work in other areas, aside from the successful domestic study tour and some high quality, but limited, policy work. The TE team believes the new project team made the right decision, given the urgency, to focus mainly on this work. The most significant shortcoming the TE team sees is that, given the number

Exhibit 11. Pipeline Projects Supported by *Ukraine Bioenergy Project* with Feasibility Studies and/or Detailed Technical Design
Arranged by Assessed Likelihood of Implementation (Most Likely to Least Likely)

Municipality (Support by Project as FS, TD, Gr)*	Type of Project and Scale (fuel)	Investment Required or Realized (USD)	Lifetime GHG ERs (t CO2) (lifetime in years)	Likelihood of Implementation and Evidence/ Comments
1. Nevytske village – school, Zakarpatska Oblast (87% Gr)	140 kW boiler (sunflower husk and straw pellets)	$6,000	1,020 t (10 yrs)	100%: Constructed and in operation as of 2019
2. Odessa Hospital No. 11 (TD)	4.5 MW boiler (sunflower husk pellets)	$406,000	39,102 t (14 yrs)	100%: Constructed and in operation as of 2019
3. Zhytomyr –school (TD, 30% Gr)	2.1 MW boiler (agro-pellets†)	$231,640	40,745 t (14 yrs)	95%: Commissioning early 2020 expected (own funds and loan confirmed): Winner of tender selected; boiler already being manufactured.
4. Kryzhopil Village, Vinnytsia Oblast (TD, 30% Gr)	300 kW boiler (agro-pellets)	$164,080	1,470 t (10 yrs)	95%: Commissioning end of 2019 expected (own funds and investor funds). Winner of tender selected; boiler already being manufactured.
5. Palanka Federation, Cherkasy Oblast (TD, 30% Gr) – Village #1	220 kW boiler (straw briquettes)	$149,000	1,060 t (10 yrs)	95%: Have construction permit and TE team saw groundwork; UNDP carried out tender for equipment; contract signed with boiler house constructor; commissioning expected end of 2019.
6. Palanka Federation, Cherkasy Oblast (TD) – Village #2	220 kW boiler (straw briquettes)	$105,000	1,060 t (10 yrs)	95%: Implementation in 2020 expected.
7. Palanka Federation, Cherkasy Oblast (TD) – Village #3	220 kW boiler (straw briquettes)	$106,000	1,060 t (10 yrs)	95%: Implementation in 2020 expected. Have construction permit.
8. Uman City, Cherkasy Oblast – school #7 (FS, TD)	300 kW (sunflower husk and straw pellets)	$108,000	1,325 t (10 yrs)	95%: finalized TD awaiting examination by expert team, municipality said to have the budget. Commissioning by Nov. 2020 expected.
9. Uman – school #10 (FS)	300 kW (straw pellets)	$108,000	1,450 t (10 yrs)	95%: final TD delayed*, but municipality said to have the budget. Commissioning by Nov. 2020 expected.
10. Uman – school #23 (FS)	100 kW (straw pellets)	$52,000	480 t (10 yrs)	95%: final TD delayed, municipality said to have the budget. Commissioning by Nov. 2020 expected.
11. Uman – school #6 (FS, TD)	200 kW (sunflower husk and straw pellets)	$84,000	1,500 t (10 yrs)	95%: finalized TD awaiting examination by expert team, but municipality said to have the budget. Commissioning by Nov. 2020 expected.

12. Beresdiv Village, Khmelnytskiy Oblast – schools (FS, TD)	300 kW (straw briquettes)	$46,000	1,450 t (10 yrs)	95%: Finalized TD awaiting examination by expert team; municipality said to have the budget. Commissioning by Nov. 2020 expected.
13. Zaitseve Village, Dnipro Oblast (FS, TD)	400 kW (sunflower husk pellets)	$85,000	1,930 t (10 yrs)	95%: final TD delayed, but municipality said to have the budget. Commissioning by Nov. 2020 expected.
14. Odessa Hospital #8 (TD)	2.5 MW (agro-pellets)	$365,000	16,688 t (14 yrs)	75%: Finalized TD awaiting examination by expert team. Good payback period of 4 years. Commissioning by Nov. 2020 expected.
15. Odessa School #11 (TD)	700 kW (agro-pellets)	$284,000	4,676 t (14 yrs)	75%: Finalized TD awaiting examination by expert team. Good payback period of 4 years. Commissioning by Nov. 2020 expected.
16. Ratne, Volyn Oblast – Hospital (TD)	2.2 MW (energy willow chips)	$360,000	14,938 t (14 yrs)	75%: Finalized TD awaiting examination by expert team. Municipality has budget for 2020 and has experience in biomass.
17. Drogobych, Volyn Oblast – District heating (TD)	1 MW (agro-pellets)	$320,000	7,434 t (14 yrs)	75%: Municipality has budget for 2020 and has experience in biomass.
18. Voznesensk city, Mykolaiv region – school (FS, TD)	350 kW (straw briquettes)	$48,000	1,660 t (10 yrs)	75%: TD completed, finalized TD awaiting examination by expert team. Commissioning by Nov. 2020 expected. Municipality has budget for 2020. Very active mayor. Good reputation with donor community.
19. Voznesensk city, Mykolaiv region – school (FS, TD)	350 kW (straw briquettes)	$50,000	1,660 t (10 yrs)	75%: TD completed, finalized TD awaiting examination by expert team. Commissioning by Nov. 2020 expected. Municipality has budget for 2020. Very active mayor. Good reputation with donor community.
20. Gnivan City – Hospital (TD)	1 MW (agro-briquettes‡)	$202,000	7,182 t (14 yrs)	75%: Construction is slated to start early 2020. Expert report has been submitted to a session of local deputies
21. Berezdiv Village, Khmelnytskyi Oblast – schools (FS, TD)	300 kW (straw briquettes)	$57,000	1,305 t (9 yrs)	75%: Chances considered good.
22. Bakhmut City, Donetsk Oblast	4 MW (sunflower husk pellets, cereal straw pellets, and wood pellets)	$847,000	39,830 t (14 yrs)	50%: An Estonian private company has leased the whole city's heat supply system and probability for implementation in 2020 or 2021 considered high. The company is looking for funding sources.
23. Shostka City Council, Sumy Oblast, District Heating (FS)	4 MW (sunflower husk pellets)	$704,000	26,425 t (14 yrs)	50%: This project is financially feasible (under the assumption of 50% of loan financing with 20% of interest rate) and likely will be implemented in 2020
24. Nizhyn City, Chernihiv Oblast (FS)	2 MW (sunflower husk or straw pellets)	$194,000	22,106 t (14 yrs)	50%: Considered by Bioenergy Roster Team to have good chances for implementation in 2020 or 2021. Since 2016 the City council has been interested in developing this

				project. This project (2 MW biomass boiler + peak boiler) is financially feasible and of interest of the project developer
25. Veselynove Village, Mykolaiiv Oblast (FS)	500 kW (straw briquettes)	$149,000	1,890 t (10 yrs)	50%: Considered by Bioenergy Roster Team to have good chances for implementation in 2020 or 2021. This project is financially feasible (IRR=21%), with modest investment need. Financing scheme considers own funds and loan (49.7%).
26. Merefa City, Kharkiv Region (FS)	Briquette production from energy crops/ poplar chips (1,200 tpy)	$119,000	61,912 t (19 yrs)	50%: Considered by Bioenergy Roster Team to have good chances for implementation in 2020 or 2021. Bank loan from Ukrgazbank is planned (ECO-loans for purchasing of equipment) – up to 70% of the cost of the main equipment or 29.3% of the capital costs. The rest will be covered by the local and/or state funding. This project is financially feasible (IRR=21%), with relatively modest investment need and short implementation period (6 months)
27. Obukhiv Village, Vinnytsia Oblast – school (FS)	300 kW (straw briquettes)	$46,000	7,890 t (10 yrs)	50%: Considered by Bioenergy Roster Team to have good chances for implementation in 2020 or 2021. This project is financially feasible (IRR=24%), with modest investment
28. Tyshkivtci Village, Dobrovelychky Raion, Kirovograd Region (FS)	300 kW (sunflower husk pellets)	NA	2,755 t (10 yrs)	50%: Considered by Bioenergy Roster Team to have good chances for implementation in 2020 or 2021. This project is financially feasible (IRR=22%), with modest investment need. Financing scheme considers own funds and loan (30% of total costs, interest rate 20%)
29. Bolgrad City, Odesa Region (FS)	Grapevine briquette production (4,000 tpy)	NA	61,912 t (20 yrs)	50%: Considered by Bioenergy Roster Team to have good chances for implementation in 2020 or 2021. This project is financially feasible (IRR=34%)under the assumption of loan financing from Ukrgazbank (ECO-loans for purchasing of equipment – up to 70% of the cost of the main equipment or 40.6% of the capital cost.), it can be implemented in 9 months.
30. Kiyvsharivka City, Kharkiv Oblast (FS)	CHP: 25 MWth, 6 MW power (straw bales)	$35,002,019	1,551,160 t (20 yrs)	35%: City paid ≈ USD 240,000 for detailed technical design with their own funds, confirming high interest, but investment also very high, so may be challenging to get funding. Significant chance to be implemented in 2020 or 2021. Contract for TD signed on Nov. 5, 2019 will be prepared by Dec. 31, 2019 per contract.
31. Korosten City, Zhytomyr region (FS)	4 MW (sunflower husk pellets and cereal straw pellets)	$590,000	39,083 t (14 yrs)	35%: Project has been inserted into city's proposed heat supply scheme (July 2019). The city is looking for

				financing for implementation. Significant chance to be implemented 2020 or 2021.
32. Starokonstantyniv, Khmelnytsky Oblast (FS)	1 MW (sunflower husk pellet)	$134,000	14,000 t (10 yrs)	35%: Municipality shows strong interest in the project. No municipal funding was available in 2019. The city doesn't wish to involve private investor or loan financing, but have plans to get funding from the city in 2020. Significant chance to be implemented 2020 or 2021.
33. Naddnipryanske Town, Kherson Oblast (FS)	1 MW (sunflower husk pellet)	$108,000	5,200 t (10 yrs)	20%: (possible implementation between 2020 and 2023). ToR for TD prepared, trying to get the approval from the city. Looking for grant (USAID ESP project).
34. MykhailoKotsiubynske Town, Chernihiv Oblast (FS)	Straw briquette production (2,500 tpy)	$268,000	21,915 t (9 yrs)	20%: (possible implementation between 2020 and 2023)
35. Divychkivska Village Kyiv Oblast (FS)	Corn stover briquette production (1,200 tpy)	$105,000	8,856 t (9 yrs)	20%: (possible implementation between 2020 and 2023). Village Council seeking funding.
36. Loza Village, Zakarpattia Oblast (FS, TD)	100 kW (energy willow chips)	$10,000	580 t (11 yr)	20%: (possible implementation between 2020 and 2023). Plan to use own funds.
37. Radekhiv city, Lviv region	Energy crop	$96,400	17,443 t (26 yr)	20%: (possible implementation between 2020 and 2023). The land on which it is planned to create the energy willow plantation is in the process of being transferred to "Radekhivteploenergo" LLC for permanent use
38. Ksaverivka Village, Kyiv Oblast (FS)	Energy crop (willow)	$288,000	35,311 t (26 yr)	20%: (possible implementation between 2020 and 2023). Approximately 20 hectares of energy willow and poplar were planted (90 ha planned in total). Costs - ca UAH 500,000 (USD 20,000). The harvested biomass will be used in the boiler house.
39. Kherson city, Kherson Oblast (FS)	190 kW (sunflower husk)	$66,000	10,000 t (10 yrs)	20%: (possible implementation between 2020 and 2023)
40. Pyriatyn City, Poltava Oblast (FS)	550 kW (three boiler houses -	NA	5320 t (10 yrs)	20%: Financial viability not confirmed. (possible implementation between 2020 and 2023).
41. Veselynove Village, Mykolaiiv Oblast	Straw and reed briquette production (4,000 tpy)	$244,000	106,077 t (19 yrs)	20%: (possible implementation between 2020 and 2023)
42. Melitopol City, Zaporizhzhia Oblast (FS)	500 kW (sunflower husk pellets)	$80,000	1,100 t (10 yrs)	20%: Financial viability not confirmed. (possible implementation between 2020 and 2023)

43. Pryazovske Village, Zaporizhzhia Oblast (FS)	1 MW (sunflower husk pellets)	$132,000	4,800 t (10 yrs)	20%: Do not have money for the project. But looking for grant (USAID ESP project). Financial viability is not confirmed. (possible implementation between 2020 and 2023)
44. Babyna Village, Lviv Oblast (FS)	1.6 MW (energy willow chips)	NA	11,115 t (10 yrs)	20%: (possible implementation between 2020 and 2023)
45. Obukhiv Village, Vinnytsia Oblast (FS)	Production of briquettes from energy crops (1,500 tpy)	NA	0 (GHG ERs counted in partner boiler project)	20%: (possible implementation between 2020 and 2023)
46. Korosten, Zhytomyr Oblast	450 kW (agri-biomass briquettes)	$60,000	0 (replacing wood logs)	20%: Financial viability not confirmed. (possible implementation between 2020 and 2023)
47. Nizhyn, Chernihiv Oblast	450 kW (sunflower husk or straw pellets)	$71,600	4,032 t (14 yrs)	20%: Financial viability not confirmed. (possible implementation between 2020 and 2023)
48. Loza Village, Zakarpattia Oblast	Energy willow plantation	$96,400	17,446 t (26 yrs)	20%: (possible implementation between 2020 and 2023)
Total (*if all projects were to be implemented*)	**(*boilers only*) 64.64 MWth +6 MW electricity (*39.64 MWth if eliminating largest project*)**	**$42,747,139 (*including only those with available info) ($7,745,120 if eliminating largest project*)**	**2,227,353 tons CO2 (*676,193 if eliminating largest project*)**	---
Probability-weighted Total (*weighting each item by respective probability of implementation*)	**(*boilers only*) 32.585 MWth +2.1 MW electricity (*if eliminating largest project: 23.835 MWth*)**	**$16,711,971 (*if eliminating largest project: $4,461,264*)**	**856,317 tons CO2 (*if eliminating largest project: 313,411 t*)**	---

† Term "agro-pellets" used when two or more pellet feedstocks are to be used but not designated, though known to include substantial share of agri-biomass.
*Note: "Final TD delayed" indicates that either the TD did not yet received the required approval from an expert organization (last step) or that the TD has not been completed yet (first step).
‡Term "agro-briquettes" used when two or more briquette feedstocks are to be used but not designated, though known to include substantial share of agri-biomass.

Exhibit 12. Overview of Municipal Agro-Bioenergy Pipeline Developed Last 1.5 Years of Project

No. of projects: 48 distinct ones, including with some overlap 33 feasibility studies, 19 detailed design, 4 grants
Type of projects (*number of each*): Boiler: 38, Briquette: 6, Energy crops: 3, CHP:1
Type of fuel for boilers (*number of each*): sunflower husk pellets: 9, straw briquette: 8, "sunflower husk or straw pellet": 6, "agro-pellet*": 5, energy willow chips: 3, "agro-briquette": 2, straw pellets: 2, straw bales: 1
Type of material for briquette making (*number of each*): straw: 1, straw and reed: 1, corn stover: 1; grapevine: 1; poplar chips: 1; energy crops – general: 1 **Type of energy plantation (*number of each*)**: willow: 2; unknown: 1
Scale of boiler projects (*no. of each*): 0-499 kW (20); 500-999 kW (4); 1-5 MW (14); 20 MWth+6 MWe (1)
Level of investment of projects (*number of each*): <$20,000 (2); $20,000-$99,000 (15); $100,000-$249,999 (15); $250,000-$499,999 (7); $500,000-$999,999 (3); $35 million (1).
Lifetimes of projects (*number of each*): 10-11 yrs (26); 15 yrs (12); 20-21 yrs (4); 27 yrs (3)
Lifetime GHG ER levels of projects (*number of each*): <5,000 t CO2 (21); 5,000-19,999 t (13); 20,000-49,999 t (8); 50,000 – 99,999 t (2); 100,000-199,999 t (1); >1 million t (1)
Likelihood of projects (*number of each*): Already implemented (100% likelihood): 2; High likelihood to be implemented in 2019 or 2020 (95% likelihood): 11; Strong likelihood to be implemented in 2020 (75% likelihood): 8; Good chance to be implemented in 2020 or 2021 (50% likelihood): 8; Significant chance to be implemented 2020 or 2021 (35% likelihood): 3; Possible implementation 2020-2023 (20% chance): 16.

*Term agro-pellet is used when more than two feedstocks are used (majority being agri-biomass) or when two or more feedstocks are used but not designated, though known to include substantial share of agri-biomass.

of municipalities in Ukraine, the number of applications from municipalities received in each round for the feasibility studies and designs was relatively low. In the first round, 40 applications were received. Yet there are 450 cities in Ukraine and 850 new administrative units, with the federations of villages recently being set up. The total, then, is 1,300. Greater outreach may have generated a lot more applications and thus led to an even higher overall probability of implementation of projects. One caveat is that the first round called for applications from the eight oblasts on which the project had been focusing rather than from all 24 oblasts of the country. Further, problems with the project's awareness contract meant that UNDP needed to cancel that contract. Had the TOR and procurement for that awareness contract been better designed and more cost effective, awareness work might have been integrated with a call for proposals for pipeline projects. Yet, given the time constraints, the TE team believes the project did fairly well. It coordinated in its call for municipal applicants with SAEE, which supported the outreach, so that the 40 applications flowed in after just one call for proposals and allowed the project to move forward with the speed that was needed.

The *Ukraine Municipal Bioenergy Project's* approach to supporting detailed technical design is considered innovative and something that other donor project have not done much of in the past. UNDP Ukraine may wish to replicate this approach in future projects. As background, donor projects cannot select consultants directly to carry out the detailed technical design, as regulations require that the cities procure the certified design company themselves. The *Ukraine Municipal Bioenergy Project* thus adopts a methodology to assist in two ways: (1) Consultants from the project's bioenergy expert roster assist the cities in preparing/ improving the TORs for the design companies whose services the cities hope to procure. (2) The project pays for the design work carried out by the design firm selected by the city. As design work must be approved by a certified external expert organization before construction can start, the *Ukraine Municipal Bioenergy Project* arranges its payments for design to require the expert approval be achieved before payment is made to the design company. In terms of assistance on the TOR, the smaller municipalities may require more assistance than the larger ones as they do not always have engineers among their staff. For both small and large cities, the project experts provide recommendations on the TORs to ensure they fit with Ukrainian state building norms and relevant legislation. The highest amount paid for designs is USD 10,000, though this would be more common for the MW-level projects, whereas those projects in the hundreds of kilowatts range may have a much lower design cost.

4. Component 3 Results/ Effectiveness Part 2: Investment/Installation - Financial Support Mechanism

This second results section covers the work under Component 3 on the financial support mechanism ("FSM"). The FSM was to be a key part of Component 3 work and to be a means of providing financing for municipal bioenergy projects. As noted in Sub-section 2-2, the project progress on the FSM is considered one of the most notable results of the project. At the same time, the result did not reach the level envisioned in project design. In a sense, the project has created a great basis for the future of municipal lending in Ukraine and potentially for loans for municipal bioenergy projects, but more progress is needed. Municipal loans have been relaunched, but the number of loans is still limited. And, most loans are going to larger municipalities. What's needed is additional removal of barriers so that more loans go to small and medium-sized municipalities and so that there are more bioenergy loans, beyond the one such bioenergy loan (made to the city of Uman) that has occurred so far.

Exhibit 13. Summary of Ukraine's Municipal Loans (by State Banks) and Project Activities that Facilitated Restart of Municipal Lending in Ukraine by Domestic Banks

<table>
<tr><th colspan="4">Number of Municipal Loans by Ukrainian State Banks by Year (21 total over the period)</th></tr>
<tr><th>2016</th><th>2017</th><th>2018</th><th>2019 (to Oct. 31)</th></tr>
<tr><td>0</td><td>1</td><td>11</td><td>9</td></tr>
<tr><th colspan="4">Cities Receiving Loans: Population, No. of Loans, Rough Amount of Loans Total, Calculated in USD</th></tr>
<tr><td colspan="2">Loans to larger cites (pop. > 700,000) during the period</td><td colspan="2">Loans to smaller cities during the period</td></tr>
<tr><td colspan="2">15 loans to 4 cities as follows:
Dnipro (pop. 966,000): 4 loans (USD 59 M)
Odessa (pop. 993,000): 3 loans (USD 120 M)
Kharkiv (pop. 1.4 million): 2 loans (USD 20 M)
Lviv (pop. 721,000): 2 loans (USD 18 M)</td><td colspan="2">6 loans to 4 cities as follows:
Ivano-Frankivisk (pop. 230,000): 3 loans (USD 12 M)
Vinnytsia (pop. 370,000): 1 loan (USD 10 M)
Melitopil (pop. 153,000): 1 loan (USD 2 M)
Uman (pop. 83,000): 1 loan (USD 1 M) (for bioenergy)</td></tr>
<tr><th colspan="4">Project Activities Leading to Relaunch of Municipal Loans</th></tr>
<tr><th>Timeline</th><th>Partners/ Team</th><th>Activities</th><th>Results</th></tr>
<tr><td>-Work launched: 2016
-National Bank of Ukraine issued letter to Oschad Bank: April 2017
-Work completed: 2018</td><td>-International Finance Consultant
-IFC
-Oschad Bank</td><td>-Liaison with National Bank of Ukraine
-Liaison with Ministry of Finance
-Development and Launching of Credit Rating System for Municipalities
-Preparation of Reports
-Training of Banks</td><td>-National Bank of Ukraine agreed that reserve rate for municipal loans can be based on credit rating rather than collateral
-Ministry of Finance clarified requirements for municipalities to apply for loans
-Interest of state banks in municipal loan market increased</td></tr>
</table>

Data on municipal loans by state banks in Ukraine correlates well with project activities that made the restart of such loans possible. Consultations further confirm that it was indeed activities of the project that made the restart of such loans, which had completely stopped in 2012, possible. While municipal loans might have restarted in the long run without intervention from the project, it is likely this would have taken a number of years or at least not have been done with a framework as suitable to smaller and medium-sized cities as the current framework now is. Exhibit 13 summarizes the municipal loans made by state banks in recent years as well as project activities that facilitated the restart of such loans. Its top

Exhibit 14. Evidence of Relaunch of Municipal Bank Loans: Domestic Bank Loans Issued to Ukrainian Municipalities by State Banks†
for the period 2016-2019 (as of October 31, 2019) *

The Applicant/ Municipality	Creditor	Date of conclusion of the contract	Amount in mln. UAH**	Interest rate	Term (years)	Date of loan repayment
Dnipro City Council	JSC JSB "Ukrgasbank";	9/2/2019	170.0	19.50	3.0	01.09.2022
	PJSC "State Savings Bank of Ukraine"‡;	9/9/2019	300.0	19.50	5.0	9/9/2024
Zaporizhzhia City Council	PJSC "State Savings Bank of Ukraine";	10/11/2019	300.0	19.50	5.0	10/11/2024
	JSC JSB "Ukrgasbank";	10/22/2019	300.0	19.50	5.0	20.10.2024
Odessa City Council	PJSC "State Savings Bank of Ukraine";	7/17/2019	1,000.0	19.50	5.0	7/16/2024
Vinnytsia city united territorial community	JSC JSB "Ukrgasbank";	6/25/2019	249.0	19.50	5.0	6/24/2024
Kharkiv City Council of Kharkiv region	JSC JSB "Ukrgasbank";	8/23/2019	250.0	18.00	3.0	8/24/2022
	JSC JSB "Ukrgasbank";	8/23/2019	250.0	18.00	3.0	11/23/2022
Dnipro City Council	JSC JSB "Ukrgasbank";	1/28/2019	500.0	18.40	2.0	11/1/2020
Odessa City Council	JSC JSB "Ukrgasbank";	12/20/2018	1,000.0	22.40	5.0	12/15/2023
Uman City Council of Cherkasy region	JSC JSB "Ukrgasbank";	9/19/2018	24.8	18.01	5.0	9/18/2023
Zaporizhzhia City Council	JSC JSB "Ukrgasbank";	7/13/2018	250.0	17.60	5.0	7/11/2023
	PJSC "State Savings Bank of Ukraine";	7/16/2018	250.0	17.60	5.0	7/15/2023
Dnipro City Council	JSC JSB "Ukrgasbank";	5/25/2018	500.0	17.40	2.0	5/24/2020
Melitopol City Council of Zaporizhzhia region	JSC JSB "Ukrgasbank";	7/18/2018	50.0	18.50	5.0	7/17/2023
Ivano-Frankivsk City Council	JSC JSB "Ukrgasbank";	9/13/2018	100.0	17.50	1.0	9/13/2019
	JSC JSB "Ukrgasbank";	9/13/2018	100.0	17.50	3.0	6/30/2021
	JSC JSB "Ukrgasbank";	9/13/2018	100.0	17.50	2.0	9/11/2020
Lviv City Council	PJSC "State Savings Bank of Ukraine";	5/21/2018	220.0	17.89	3.0	30.06.2021
	PJSC "State Savings Bank of Ukraine";	5/21/2018	220.0	17.89	3.0	30.06.2021
Odessa City Council	JSC JSB "Ukrgasbank";	12/1/2017	1,000.0	17.50	5.0	11/10/2022

†Does not include loans by Ukraine Ministry of Finance or Ukraine ExIm Bank and does not include foreign currency loans by International Financial Institutions (IFIs).
* In 2016, the mentioned borrowings were not carried out and credit agreements with state banks were not concluded.
**During 2016-2019 the exchange rate was volatile. The current rate on 1.11.2019 is 1$ = 24,81 UAH
‡PJSC State Savings Bank of Ukraine is the same as Oschad Bank

part is based largely on Exhibit 14, which gives the full list of such loans as acquired by the TE Team from Ukraine's Ministry of Finance.

The timing of these municipal loans, the first of which occurred in December 2017, is congruent with the work and achievements of the project. In April 2017, due to work of the project, the National Bank issued a letter to Oschad Bank explaining that municipal loan reserve rates could be based on credit rating. Prior to this, municipal loans in Ukraine were not attractive to state banks as the reserve rate (the amount of capital the banks were required to keep on hand to back up the loan) was very high, because municipalities could not use collateral to guarantee their loans. The success of the project is that it got the National Bank of Ukraine to allow the banks to make unsecured lending (i.e. not with collateral) to municipalities based on their credit rating and thus with a low reserve rate.

Further, the project worked with Ministry of Finance to clarify rules for municipal lending. Municipalities are required to get permission from Ministry of Finance to apply for bank loans. Yet, the procedures for such application were previously not clear. One of the results of project work is the Ministry of Finance clarified these rules, so that small and medium-sized municipalities, with less resources to liaise with Ministry of Finance as compared to large cities, had a guide to how to proceed.

In terms of partners, the project recruited an international consultant with finance experience and partnered with IFC to carry out the FSM work. Oschad Bank was also a partner. These partners were important in liaison with Ukraine's National Bank and with Ministry of Finance in achieving the realized changes. IFC carried out substantial TA work, which included design of the credit rating system, preparation of a number of reports, and training of domestic banks. The TE team is impressed with the results achieved with Ukraine's National Bank and Ministry of Finance as well as training of the domestic banks. The training of the banks attracted a lot of attention, with one webinar having at least 50 banking sector participants. A mindset change was seen to have been achieved in that some within the banking sector now recognize the attractiveness of the municipal lending market and see municipalities as "clients who will always be there and never go out of business." Interestingly, while Oschad Bank was the main targeted partner for this work, it is UkrGasBank that has risen to the lead in municipal loans by state banks, being responsible for 15 of the 21 loans made to date and all of the six loans made to smaller municipalities.

The FSM work has faced a challenge of high interest rates during the period as the major disincentive to municipalities to take out bank loans. This must be acknowledged as a major barrier to the project in achieving realization of the financial support mechanism as a stimulator of bioenergy investments. As can be seen from Exhibit 14, municipal bank loan interest rates have ranged from 17.4 to 22.4 percent during the period. There are two suggestions that, in retrospect, the project ideally would have considered at the time to address this challenge. One of these suggestions is greater outreach to and education of municipalities so that they will understand that, even in a high interest rate environment, taking out loans can make sense if the "math works." That is, if the returns of investments, such as bioenergy projects, are high enough, it can make more sense to take out a high interest rate loan than to do nothing. The second option the project might have considered is adaptive management vis-à-vis the nature and definition of the "financial support mechanism" it was to develop. In retrospect, with the project's achievement in its feasibility studies and technical design work stimulating a project pipeline that is getting funded, it can be seen that bank loans are not the only means to financing – there are also the private sector and municipal budgets, which are funding the majority of projects getting funded. Thus, in interpreting the task for a "financial support mechanism", the project could have pursued a broader interpretation to look at how to support municipalities in tapping these other sources of financing. For example, the project could have worked on how municipalities could better attract the private sector to invest in bioenergy projects. Indeed, from consultations, the TE team learned that municipal bioenergy investments are attractive to private sector entities that have cash on hand due to high returns and relatively large size of investments.

While the TE team is quite complementary of the FSM work with regard to restarting municipal loans, there is one area in retrospect in which it might have been improved. The work as designed for the IFC might have put more emphasis on action and results than on studies. As understood by the TE team, IFC very much saw its task to provide information and analysis and suggestions, but not to proactively ensure that the municipal bank loan market became active. Less emphasis on reports (though the reports prepared are of high quality) and more emphasis on active liaison with municipalities and banks for "deal making" – making the loans happen for bioenergy projects – might have led to more bioenergy loans being realized than the single loan to Uman to date.

With regard to this work, UNDP CO may wish to consider a few follow up measures. The first will be to "own" and recognize this very important result of relaunching the municipal loan market in Ukraine. This might be publicized in outreach materials or raised with counterparts in discussions. It might also be considered as a basis for further work, as there is still a need to remove barriers to ensure that small and medium sized cities are taking advantage of the improved conditions for municipal bank loans. As noted, more education of municipalities as to the benefit of such loans "when the math makes sense," even in a high interest rate environment, might be carried out. In addition, small and medium sized cities may need help in carrying out proper accounting so that they have the necessary financial records to be a good loan candidate. If UNDP becomes involved in additional biomass work, as looks to be a good possibility, this work will be much more impactful if loans can indeed be leveraged to do more bioenergy projects. Further, outreach may also prepare such municipalities for the day when a lower interest rate environment emerges. In general, such work related to small and medium cities, which have smaller projects to finance, is a good fit with UNDP's comparative advantage, especially when one considers that IFIs have large minimum investment levels for projects they support, such as the € 5 million minimum project size in the case if EBRD. While some donors, including EBRD, have developed programs for very small loans, such as for individual households, the middle area of financing that would address the needs of small and medium-sized cities is a critical gap that needs to be addressed.

An interesting recommendation emerging from the FSM work is one made by the project's international financing expert during his engagement with the project. The recommendation is that UNDP Ukraine set up a long-term support platform within the CO that would go beyond individual donor projects with their short durations (e.g. of 3 to 5 years) to provide support for getting investment projects in priority areas financed. Multiple priority areas might be addressed, one of which would be municipal bioenergy projects. The rationale is that a lot of UNDP's donor-funded projects are trying to support similar things – financial mechanisms and getting small and medium-sized investment projects in priority areas to happen. The challenge is that, if one tries to develop a financing mechanism during a project, most of the time may be used in developing the mechanism. Thus, by the time the mechanism is developed, there may be little time left to realize its implementation. The proposed platform would be a way to support initiatives beyond the life of the UNDP project with a few expert personnel in the UNDP CO. Various parties in Ukraine could come to the platform with a need for support for their business project. This certainly might include small and medium-sized municipalities aiming to get bioenergy projects financed. This platform could be semi-sponsored with funds from various donor projects as they occur, but also might charge for its services to ensure "skin in the game" on the part of clientele. This idea of a long-term support platform for development of investment projects in priority areas may have synergies with the aim of Component 3, which was to set up a one-stop shop for bioenergy project development.

5. Component 3 Results/ Effectiveness Part 3: Investment/Installation - Early Straw Pellet Boiler Demonstrations and Other Phase One Component 3 Activities

This third results section covers the projects' work under Component 3 in its first phase (first 3.5 years) in installing 12 demonstration straw pellet boilers. It also covers other significant activities under Component 3 carried out in the first phase of the project, aside from the FSM work, which was discussed in the preceding section and is considered the strongest result of the first phase of the project, given that the 25% grant, 75% debt or municipal funds model defined in the project document was not followed in that first phase. The other significant Component 3 activities of the first phase include five grants, three supporting the establishment of energy crop plantations, one supporting a biomass pellet quality study, and one supporting development of an energy efficiency monitoring system. They also include two significant studies, one on the biomass boiler market in Ukraine and one on the biomass pellet market in Ukraine. The TE team notes that the previously discussed awareness contract, a study tour, and conferences have been charged in the project budget under this component. Due to their close links to awareness raising, however, these will be discussed in the section covering the awareness component (Section 8).

Straw pellet boilers: Near the beginning of the project, on Nov. 4, 2014, and only about 1.5 months after the first project manager was hired, the project issued an invitation to bid on the supply and installation of ten straw pellet biomass boilers in municipalities. Not only was the invitation to bid specific as to the type of agri-biomass fuel (straw pellets), it included very specific technical requirements. As noted from the publicly posted Q&A on the bid, one potential bidder questioned the high level of specificity prior to determining where the boilers would be installed. The potential bidder noted that usually the site and its requirements are first determined before determining the boiler specifications. As noted in Sub-section 2.3, the TE team finds this large contract reflects major shortcomings of the project during its first phase.

The contract was won by Avers or "Aver-Tech." As discussed in Sub-section 1.3, in which early history of the project is reviewed, Avers is the only boiler manufacturer that is known to have been involved in the design phase of the project. Actually, Avers was not really supplying boilers to the market at that time, but is said to have developed one or two straw pellet boilers for its own internal use. The company at the time it bid on the *Ukraine Bioenergy Project* opportunity was very much in the R&D phase with its straw pellet boilers and indeed considers itself to be in the R&D phase today, though just about ready to more fully launch itself in the market. Sources suggest its focus will be more on the European market outside of Ukraine, where its high price points are more likely to meet with success. The company sees its 220 kW boilers ("generation 1"), which were supplied to the project, as more experimental and not profitable, but has now developed 500 kW ("generation 3") models which it believes can be sold profitably. GEF projects do not typically support R&D as they usually aim, as does the *Ukraine Bioenergy Project*, to demonstrate technologies that can quickly be taken up by the market and replicated. The Avers contract was initially for USD 1.29 million to cover ten boilers and their installation at a price of USD 129,000 per boiler inclusive of 20% VAT. The project team eventually expanded the project to cover a total of 12 boilers for a total contract value of USD 1.548 million, with the same price per boiler inclusive of VAT. In the end, net payment to Avers was reduced by around USD 150,000 due to rebates of VAT on procurements achieved under this contract in 2015. All 12 boilers are "off-grid," meaning that they supply locales that are not on the district heating grids but instead have individual boilers to provide heating to their facility. For many cities, the off-grid population of boilers is relatively small compared to

the main district heating system, which raises the question of whether the project should also have looked for a way to get bioenergy into the district heating systems, if it wished to truly have a major impact on municipal heating. Yet, for smaller places, especially villages (many of which have a new, municipal-like status as "federations" of villages), most or all installations may be off-grid.

While the installation of the Avers straw pellet boilers were not without benefits (and these will be discussed further below), the TE team believes they were not the most strategic way for the project to spend its funds and time. Further, their procurement does not honor the design of the project document. Issues are summarized as follows:

- The procurement focuses a large among of project funds (USD 1.548 million) on a single supplier rather than diversifying. Further, this single suppler was and is in an R&D phase and is a high-cost supplier than may end up focusing more on the European market outside of Ukraine, once it goes seriously to market.
- GEF funds were used for 100% of boiler procurement and installation costs. There was some co-financing (perhaps up to 15%) from municipalities for aspects such as cement base for the boilers, which are outdoor boilers. The ProDoc explicitly states that the project should provide not more than 25% grant to boiler installations, with the aim being to leverage other financing. While it is true that it may have been difficult to get 75% co-financing early in the project, the need to support procurement and installation of 12 boilers instead of just one or two as initial pilots does not seem justified.
- Choosing straw pellets as the feedstock for all 12 of the project-procured boilers also seems too narrow. On the one hand, support of straw pellet boilers may be justified as a new area that needs support. Yet, as noted, the Ukraine Bioenergy Association projections suggest that corn stalk will be the larger contributor in the "straw and stalk" category going forward and out to 2035. They project this category as being critical to the growth of solid biomass bioenergy in Ukraine. In retrospect, looking at the project pipeline developed in the later phase of the project, while a number of installations plan to use straw pellets, this is not the most popular feedstock. Instead, sunflower husk pellets and straw briquettes are. At the same time, it is acknowledged that straw boilers, if they are to be long-lasting, need a lower temperature than other boilers, so that the development of technology suitable to straw combustion is important.
- The city selection for this large expenditure on boilers seems too narrow. For the initial ten boilers, three were installed in Uman, four in Zhytomyr, and three at the Nature Center in Kyiv. Uman is the city in which Avers has its facility for making straw pellets and assembling these boilers. The TE team learned that Avers is providing free service to the three Uman boilers in return for access to them to gather data for its R&D effort. When the Avers contract was extended, two more boilers were installed in a city in Donetsk Oblast in Eastern Ukraine. Start-up of these Donetsk boilers has been greatly delayed and was not yet confirmed at the time of preparation of this report.
- The Avers per boiler price contracted with UNDP is extremely high compared to other types of boilers and even seems quite high for what straw pellet boilers should cost. There are indications the price paid may be almost double the market price. This will be discussed later in the section on cost effectiveness.

At the same time, the TE team was impressed with the benefits and impacts of the Avers straw pellet demo boilers, key of which are as follows:

- The early efforts of the project with the cities of Uman and Zhytomyr, the only two cities receiving demo boilers (aside from the Nature Center in Kyiv) in the early part of the project,[8] are believed to have clear links to the proactive way in which these two cities are now pursuing bioenergy. As noted

[8] The two boilers in Donetsk were installed somewhat later and had delays in becoming operational due to the need for parts that local counterparts were not willing to fund. Eventually, the project provided support for these parts as well.

in Sub-section 2.2, Uman: (i) pursued a sunflower pellet bioenergy project in 2017; (ii) is the first municipality to get a bank loan for bioenergy projects; and (iii) has several pipeline projects (with support from the *Bioenergy Project* for feasibility studies and technical design) under development. Zhytomyr, after (i) design support by the *Bioenergy Project* for a larger off-grid project of 2 MW that will be implemented soon (boiler already under fabrication), has now (ii) developed grand plans and secured initial donor funding to transform its heating system to 95%, on average, biomass. While wood will be the primary fuel, findings suggest the *Ukraine Bioenergy Project* had a significant role in influencing Zhytomyr to pursue this direction.

- The Avers boilers are quite positive for beneficiaries and have worked well. For example, the team learned that schools that have installed the boilers have been able to cut their heating costs substantially. This benefit was greatest at first, when the cost of straw pellets was very low. The cost of straw pellets has been rising, but the savings is still attractive. Aside from Uman, the other sites now must pay Avers an annual fee for maintenance, but even with this fee, they are still saving compared to what they paid when using natural gas. The TE team visited four sites that together host seven of the project's Avers boilers. All four of the host institutions report the boilers are working well.
- The Avers boilers can also serve as awareness raising and educational tools, particularly at the educational institutions at which they are installed. The Nature Center, as noted, is particularly well-placed to introduce the many students and teachers passing through to the boilers and is reported to already be doing so.

Grants: The project supported a total of five grants under Component 3. Three of these grants were to support the establishment of willow plantations in three different municipalities, as carried out by three different NGOs. The TE team did not have the opportunity to view these plantations or meet with beneficiaries and notices that the MTR team also did not visit the plantations. Discussion with NGOs and other sources via telephone suggest the plantations were established, but their limited size (5 ha) does call into question the funds spent. The NGO grants were almost USD 50,000 each, whereas planting costs reportedly may have been around just USD 1,000 per ha. This cost of USD 1,000 per ha seems plausible. According to research, the willow planting costs at maximum may have been USD 2,000 to 3,000 per ha. The NGO grants, however, did include capacity building and some other activities. The three recipients of the grants Ekomerezha, Molochay, and Shyrokyi Step were each found to have their headquarters address in Lugansk Oblast, whereas the plantation work was carried out in Poltava, Zakarpattia, and Ivano-Frankivsk, respectively. It is not clear whether this work has led to replication. The project's more recent domestic study tour did visit a 45 ha poplar plantation in Zhytomyr Oblast that is unrelated to the 5 ha plots developed under project grants. According to sources, the beneficiaries of the 5 ha of willow plantation in each location are local governments. Based on project team reporting, the MTR indicates quite a high level of NGO co-financing for this work, though given the limited area planted, this is called into question. While the TE team did not find links between the energy crop work of the three grants and any other results in the project, it is a positive development that the later phase of the project has in its pipeline three energy crop projects. It is believed these will be significantly larger and most cost effective than the NGO ones. The project is also supporting policy work in the energy crops area. While energy crops might be considered woody, they are a segment for which the Bioenergy Association sees substantial potential growth (see Exhibit 8), such that energy crops are project to be Ukraine's second highest bioenergy growth segment after "straws and stalk." It thus seems quite appropriate that the project includes energy crops in its scope. And, as a type of agriculture, in a sense these might be considered to be agri-biomass, despite their woody nature. In general, like agri-biomass, they reduce the pressure on Ukraine's limited forest area that comes from the development of bioenergy.

A *Ukraine Municipal Bioenergy Project* grant of USD 129,800 supported the NGO Novyi Svit in carrying out a study on pellet quality for the project. While the NGO was selected competitively, the TE team finds it atypical that such a large grant, on a research oriented topic, was limited to NGO

competitors. The TE team did not find that the project or anyone else has been using the results of this study. In general, the TE team recommends that UNDP-GEF projects take great care in commissioning studies and avoid these unless the studies can be used to clearly benefit the aims of the project, such as in stimulating more investment in bioenergy or improving the quality and sustainability of such investments. Yet, one of the weaknesses raised by stakeholders about the project is lack of work on the biomass supply side. Had this pellet quality study been better integrated with action-oriented work, it may have been more valuable.

The last grant that the project provided was USD 47,502 to the NGO Analytical Center for New Social and Economic Policy for work on an energy efficiency monitoring system. It was later learned that this grant was payment towards a larger grant of USD135,720 signed on Feb. 3, 2015 between UNDP and the NGO, but not specifying any project. Later, the *Ukraine Municipal Bioenergy Project* provided the aforementioned payment to the NGO as a loan to another, soon-to-be-launched project focused on energy efficiency, but later the other project did not pay back the loan, asserting this NGO grant was not in its approved work plan. While energy efficiency is considered a part of the same general realm of clean energy as bioenergy, the TE team does not see this energy efficiency monitoring system work as directly related to the aims of the *Ukraine Municipal Bioenergy Project* and did not find this activity to be indicated in the ProDoc.

Studies on pellet and bioenergy boiler markets: During the early phase of the project, two studies were commissioned, one on the biomass pellets market under a contract for USD 32,000 and one on the biomass boiler market under a contract for USD 25,000. There was initially competitive bidding on these assignments, but the winner, affiliated with an educational institution, who had bid much lower than the eventual contractor, was unable to deliver. The assignments were then passed directly to another bidder that had bid much higher but was able to deliver a high quality of work. One shortcoming is suggested in that the TE team did not see these studies to be proactively used in the rest of the project or in the biomass field generally. One issue is that the pellet market is very dynamic, so the pellet study runs the risk of becoming quickly outdated. On the other hand, while not confirmed, it's possible these studies were useful in developing the pipeline projects, which are the most outstanding aspect of the project. In the future, it is recommended that UNDP-GEF projects limit studies and ensure any high quality ones commissioned are designed to be fully leveraged in more action-oriented activities of the project or the relevant field.

6. Component 1 Results/ Effectiveness: Policy

Main activities and involved parties: For the purpose of analysis, the TE team divides the project's Component 1 work into three areas: (1) Policy work during the first phase of the project. (2) Oblast-level plans prepared during the first phase of the project. (3) Policy work carried out during the last year of the project. Each of these is discussed in turn in sub-sections below. The project under its policy component in its first phase hired over 35 individual consultants, mostly during 2015 and 2016, which seems quite unusual. Most of the contracts, however, were quite small --- of USD 5,000 or less, several for as little as USD 1,000 or USD 1,500. It was explained that in its early stages the project was in quite a hurry to draft as much legislation as possible, so thought it would be most effective to have multiple consultants working concurrently on legislation. About half of the consultants worked on policy and the other half worked on oblast-level bioenergy plans. There was a lead policy consultant, who held much larger contracts than the other individual policy consultants and who was retained for much of 2015, 2016, and 2017. He was indicated by some to be the "right-hand man" of the project manager, providing support for a broad range of project activities and known to be active in attending policy roundtables with the government and the project-supported biomass working group held at MENR. In addition to this support

in the policy area during the first part of the project, the project commissioned an analytical study on policy for about USD 38,500, carried out by an NGO, the Ukraine Nature Conservation Society. During the last 1.5 years of the project, under its new management, the main focus was put on Component 3 and very little policy work was conducted. The project in its last year, however, commissioned an assignment for policy to promote the growing of energy crops.

Results of policy work during the first phase of the project: The project claimed success in that content of three of its seven central draft legislations were included in four legislations that were actually adopted by Ukraine's Parliament. Yet, evidence of the role of the project in each of the adopted legislations was not confirmed, despite consultations during the TE mission with some key parties that should have been able to offer insights on this. Further, some of the project's policy work seems to be substantially broader than bioenergy, an approach that perhaps has both pros and cons. In general, though, the TE team would have been in favor of a narrower and more strategic focus of work. Each of the four claimed legislative successes is covered below:

1. *Bioenergy tariff policy*: Among the four claimed legislative successes, the most important adopted legislation to the bioenergy field is that allowing for heat generated by bioenergy to have a tariff that is 90% of the natural gas tariff. This is considered a great "win" for bioenergy, because prior to this, bioenergy-based heat providers were only allowed to charge on a cost plus profit basis (allowing for 6% profit) for the heat they produced. Some sources indicate this new policy is not of that great a benefit to biomass-based heating providers, because these were previously inflating their reported costs anyway, but others see it as creating a very positive environment for bioenergy to go beyond off-grid boilers (where institutions often pay their fuel costs directly) to the realm of district heating.

The TE team did not find confirmation that the *Ukraine Municipal Bioenergy Project* was a key contributor to the drafting and development of this "90% of natural gas tariff" legislation. Indeed, key government policy makers in the realm of bioenergy were unaware of any contribution of the project to bioenergy-related legislation. Further, another group, the Bioenergy Association was indicated by some stakeholders to have been the main non-government group to play a key role in drafting and promotion of this legislation. This makes sense, as the Bioenergy Association's main mandate is to promote legislation favorable to the industry. As such, it seems it would have been likely that some of the 12 or so consultants involved in drafting legislation for and/or the organization providing the analytical bioenergy policy report to the project would have been affiliated with the Association. Yet, it appears they were not. There is a lack of evidence that the project directly contributed to the initial drafting of the legislation. Yet, at the same time, it is hard to definitively say that the project did not contribute at all to the final "90% of natural gas tariff" policy. Indeed, it seems that the project made some contribution, though not the central one, in adoption of this policy. It has been reported that the UNDP Project wrote a letter to the government, to SAEE, which played a positive role in adoption of the policy. And, findings indicate that policy experts from the project participated in roundtables at SAEE to discuss this and other policies.

2. *ESCO policy*: The project claims to have contributed via its policy drafting work to the adoption of a policy that allows ESCO contracting in Ukraine. Previous to this new policy, ESCOs could not really operate properly in Ukraine as ESCO contracts would have had a maximum period of one year. The new policy allows energy service companies ("ESCOs") to engage in contracts of more than one year. While the topic of ESCOs seems broader than bioenergy and indeed more focused on energy efficiency than renewable energy, there is some relevance to bioenergy. If a private company wishes to invest in upgrading a facility to include bioenergy boilers and sign a contract with the end user for sale/purchase of the heat, it may be advantageous to the company to have a long-term contract. Interestingly, in the one case of this kind of relationship that the TE team encountered on its mission, it was indicated the private company could not ask for more than a one year contract. Thus, the company installed biomass boilers in its client's facility, but was not guaranteed more than a one year contract of heat purchase. The TE team

did not find definitive evidence of the project's contribution to the ESCO policy. Yet, given the claimed contribution, it may have been a logical next step to ensure the new legislation was leveraged in promoting private sector investment in bioenergy heating provision via long-term off-take contracts with clients. This is something that does not appear to have happened.

3. *Policy for heat metering*: The third policy that the project claims to have achieved has to do with ensuring that heat metering is implemented not only at point of generation but also at the point of consumption. Currently, just perhaps 50 to 60% of heat end users are metered. This creates the problem of heating charged by square meters of building area and not by actual use. The TE team could not confirm the project's contribution to this policy, but also feels this work is off-track in not addressing the main focus area of the project. Metering is generally considered an important measure in promoting energy efficiency, rather than in promoting bioenergy. Yet, it's possible that, in the end, a better, more rational and market oriented heating system will be good for all players involved.

Exhibit 15. Draft Policies Indicated to Have Been Prepared by the Project in its First Phase

1. Guidelines for economic and financial evaluation of municipal biomass thermal energy projects to attract budget support
2. Draft Law of Ukraine "On Amendments to the Budget Code of Ukraine on Promoting the Implementation of Bioenergy Technologies"
3. Draft Law of Ukraine "On Amendments to the Tax Code of Ukraine and Certain Legislative Acts of Ukraine on the Promotion of Biomass Utilization"
4. Draft resolution of the Cabinet of Ministers of Ukraine "On approving a plan of measures for optimization of state administration and state regulation in the field of bioenergy"
5. Draft legal acts on the use of cutting residues for energy purposes
6. Draft resolution of the Cabinet of Ministers of Ukraine "On amendments to the list of activities related to nature conservation measures"
7. The draft order "On approval of methodology of economic and financial evaluation of municipal projects for the use of biomass for budgetary support"
8. The draft law of Ukraine "On amendments to the Law of Ukraine 'On energy saving'"
9. The draft law of Ukraine "On amendments to the Law of Ukraine 'On priority of social development of rural areas and agriculture in the national economy'"
10. The draft law of Ukraine "On amendments to the Budget code of Ukraine on facilitating the implementation of bioenergy technologies"
11. The draft law of Ukraine "On amendments to the Law of Ukraine 'On housing and communal services' the provision of public services for heating and hot water supply"
12. The draft law of Ukraine "On amendments to the Law of Ukraine 'On heat supply' on the development of the use of alternative and renewable energy sources in the heating sector"
13. The draft law of Ukraine "On amendments to some laws of Ukraine concerning energy"
14. The draft order of the Cabinet of Ministers of Ukraine "On amendments to the National action plan for renewable energy for the period till 2020"
15. The draft order of the Cabinet of Ministers of Ukraine "On amendments to the Energy strategy of Ukraine for the period till 2030"
16. Projects of legal acts concerning the introduction of bioenergy technologies in the heat and hot water supply
17. The draft order "On approval of the regulation on criteria and procedure of selection of projects for the use of biomass in manufacturing and supplying thermal energy to provide services for Central heating and hot water supply"
18. The draft law of Ukraine "On amendments to the Law of Ukraine "On heat supply" on the development of the use of alternative and renewable energy sources in the heating sector"

4. Responsibility for cost of and maintenance of utilities in communal areas of residential buildings: This complicated legislation addresses various utilities – heat, water, gas, and electricity. It clarifies who is responsible for pipes/ infrastructure and who pays for utilities in communal spaces. For example, who will pay for heating of common areas? More clarification is still needed by additional policy, but this policy has improved the situation somewhat and is considered a good first step. The TE team was unable

to confirm the project's contribution to this legislation. Yet, as with the last item, the TE team would suggest that the project might have done better to focus more squarely on issues that would promote bioenergy in municipalities.

As reference, Exhibit 15 shows the policy items indicated to have been drafted by the project. Review of these items shows greater focus on bioenergy than represented among the four claimed policy successes. Exhibit 16 shows the eight main laws indicated to have been prepared by the project as well as the four adopted policies to which the project team claims its corresponding draft laws made a contribution.

Exhibit 16. Link between Key Project-Drafted Policies and Adopted Policies, as Indicated by Project Team of the Project's First Phase

№	Name of draft law developed by UNDP project	Name of the approved draft law, which, according to project team, includes parts from the draft laws prepared by the project
1.	Amendments to the Budget Code of Ukraine	---
2.	Amendments to the Law of Ukraine "On Heat Supply"	1. The Law of Ukraine "On Amendments to the Law of Ukraine 'On Heat Supply' on the Promotion of the Production of Heat from Alternative Energy Sources" was approved on 21.03.2017 No. 1959-VIII. (*Note: This is the "90% of gas tariff" legislation*.) 2. The Law of Ukraine "On Commercial Accounting of Public Utilities" was approved on 22.06.2017 by the Verkhovna Rada of Ukraine on the use of metering devices and regulation of consumption of fuel and energy resources.
3.	Amendments to the Law of Ukraine "On Introduction of New Investment Opportunities, Guaranteeing the Rights and Legal Interests of Entrepreneurs for Large-Scale Energy Modernization"	3. Law of Ukraine "On Introduction of New Investment Opportunities, Guaranteeing the Rights and Legal Interests of Entities for Entrepreneurial Activities for Large-Scale Energy Modernization" (Concerning the Mechanism of Purchasing Energy Services) - was approved on March 23, 2017 №1980-VIII by the Verkhovna Rada of Ukraine (*Note: This is the "ESCO Law" allowing contracts longer than one year*.)
4.	Amendments to the Law of Ukraine "On Alternative Energy Sources"	---
5.	Amendments to the Law of Ukraine "On the Priority of Social Development of the Village and the Agro-Industrial Complex in the National Economy"	---
6.	Amendments to the Law of Ukraine "On Energy Saving"	---
7.	Amendments to the Law of Ukraine "On Housing and Communal Services"	4. Law of Ukraine "On Housing and Communal Services" register. No. 1581-d of December 10, 2015 - was approved by the Verkhovna Rada of Ukraine on November 9, 2017. (*Note: This is the law that indicates who is responsible for utility payments and utility infrastructure in the communal areas of residential apartment buildings*.)

Results of planning work during the first part of the project: The *Ukraine Municipal Bioenergy Project* drafted bioenergy plans (or bioenergy additions to broader plans) for each of its eight partner oblasts. These plans were adopted by each oblast and thus made official. (See Exhibit 17.) Getting such plans adopted is not an easy feat. They must be voted upon by oblast-level locally elected assemblies and thus have the potential to shape the energy future of the oblast. As such, the TE team sees these plans and their adoption as a substantial contribution of the project. Interestingly, during consultations, the TE Team learned that a group associated with the Bioenergy Association had done similar work under a USAID

project for seven other oblasts in Ukraine. (There are a total of 24 oblasts in the country, so now 15 of these supposedly have bioenergy plans or plans that encompass bioenergy.) At the same time as adoption of the plans is considered a good achievement, the TE team found that no work had been done since adoption to ensure the plans are implemented. This is a substantial gap. Without guidance and/or support in implementation, the plans, while having achieved the impressive hurdle of adoption, may end up just "sitting on the shelf." One of the challenges of the project is that project management – the project team and the UNDP oversight team – changed completely between the first phase of the project (first 3.5 years) and the second phase (last 1.5 years), with a six month interim in-between. The second team felt challenged by the very limited time remaining and decided to focus the vast majority of efforts in developing a project pipeline to address Component 3 of the project. The TE team believes this was the right move, given the circumstances. Unfortunately, however, it meant that there would be no follow up to ensure the oblast bioenergy plans are utilized.

Exhibit 17. Evidence of Adoption of Bioenergy Plans or Incorporation of Bioenergy into Existing Plans in Eight Oblasts, as Supported by the Project

1. Volyn Oblast: 09/26/2018 Volyn Regional Council Amends the Decision of the Regional Council of March 20, 2015 # 34/7 "On the Strategy for the Development of the Volyn Region for the Period to 2020" and approved the Action Plan for its implementation for 2018-2020, which takes into account the project proposals on the development of bioenergy. http://volynrada.gov.ua/projects/pro-vnesennya-zmin-do-rishennya-oblasnoyi-radi-vid-20-bereznya-2015-roku-347-pro-strategiyu http://volynrada.gov.ua/projects/pro-zatverdzhennya-planu-zakhodiv-na-2018-2020-roki http://volynrada.gov.ua/news/deputati-vnesli-zmini-do-strategiyi-rozvitku-oblasti-video
2. Dnipropetrovsk Oblast: As a result of the project working together with the departments of the Dnepropetrovsk Regional State Administration to develop a draft regional program on the use of bioenergy technologies in heat and hot water supply in the Dnipropetrovsk region, the *Energy Saving, Energy Efficiency and Renewable Energy Development Strategy of Dnipropetrovsk Region*, 20 January 201735, 20173535 No. 275-11/VII was adopted by the Dnipropetrovsk Regional Council. http://oblrada.dp.gov.ua/rishennia/sklikannia-7/xi-sesiya/%E2%84%96-275-11vi%D1%96-01-12-2017/
3. Zhytomyr Oblast: In the decision of 07.03.2018 № 940, Zhytomyr Regional Council amended the decision of the Regional Council of 22.12.16 №413 "On approval of the plan of actions for 2018-2020 on the implementation of the strategy of development of Zhytomyr Region for the period up to 2020" to include regional development goals for bioenergy.
4. Zakarpattia Oblast: On July 27, 2017, the Zakarpattia Regional Council adopted amendments to the 2017 Action Plan for the implementation of the Zakarpattia Energy Efficiency and Energy Saving Program for 2016-2020, approved by the decision of the Regional Council dated March 23, 2017 No. 720, which took into account the UNDP project cooperation with Zakarpattia Regional State Administration and Zakarpattia Regional Council.
5. Ivano-Frankivsk Oblast: Targeted Program for Energy Efficiency and Development of Renewable Energy Sources for Ivano-Frankivsk Region for 2016-2020 was approved in ODA on May 13, 2016 #298 and on June 10, 2016 #230-5/2016 approved by the Oblast Council, as amended on September 15, 2017, which takes into account the project proposals. http://www.orada.if.ua/fileadmin/documents/Rishennja/2015-2020/07_05/230-5-.pdf http://www.orada.if.ua/fileadmin/documents/Rishennja/2015-2020/07_17/604-17.pdf
6. Lviv Oblast: The elaborated project proposals for the development of bioenergy technologies in the Lviv region were included in the draft Program for the development of the fuel and energy complex of the Lviv region for 2018 - 2020. http://www.oblrada.lviv.ua/UserFiles/Image/docs/proekt/2017/proekt_836.zip
7. Poltava Oblast: (i) The finalized version of the regional program for bioenergy development, coordinated with the relevant bodies of the regional administration, was sent to the Chairman of the Ecology and Rational Environmental Management Committee - Gorzhiy Igor Grigorovich. (ii) The Development Strategies and the Action Plan for the implementation of the Poltava Region Development Strategy for the period 2015-2017 have been approved. (iii) On May 7, 2018, a meeting with the Director of the Department for Economic Development, Trade and Investment Attraction of the Poltava Regional State Administration - Ishchenko Inna Sergiyevna was held, on the importance for the area of adoption of regional bioenergy development goals.
8. Cherkasy Oblast: By decision # 19-8/VII of December 22, 2017, the Cherkasy Regional Council approved the "Plan of Implementation of the Cherkasy Oblast Development Strategy for the period 2018 - 2020", which partially took into account the proposals for the development of bioenergy technologies prepared by the UNDP project. http://oblradack.gov.ua/files/docs/Rishennja/7/19/19-8-7.zip http://oblradack.gov.ua/ostanni-rishennya-sesyi/5207-xh-sesia-oblasnoii-radi-vi-sklikannia.html

Policy work during last year of project: Policy work under the new project team and for the last 1.5 years of the project is limited to just one assignment, that for drafting and promoting a policy on energy crops. While this assignment had just gotten underway at the time of the TE mission, the TE team was impressed with both the consultant and vision for this work, which in some ways contrasts with the policy work earlier in the project. First, the work planned is very specific and focused. Second, it focuses on an area (promotion of energy crops) that is directly linked to bioenergy and has strong potential, given projections of the role that energy crops may play one day in the overall mix of solid biomass fuels in Ukraine. Third, the consultant retained for this work has very strong expertise related to this work. Affiliated with the Bioenergy Association, she did her PhD dissertation not only on a topic related to bioenergy, but on energy crops policy in particular. This seems a contrast to the consultants retained earlier in the project, who may have had strong general backgrounds, but were less familiar with bioenergy. As noted earlier, it is surprising that persons affiliated with the Bioenergy Association, which focuses on promoting bioenergy-friendly policy in Ukraine, were not among the many policy consultants or contracting organizations in the first 3.5 years of the project. An added benefit of the Bioenergy Association affiliation of this consultant on energy crops policy is that promotion and other follow up of her policy work can be continued by the Association once the project ends. This is particularly important given the late start of this consultancy – it is unlikely the policy can be adopted before project end. Yet, the issue is important to the Bioenergy Association, so with the groundwork laid and more extensive work (research, consultations, and policy drafting) supported by the project, the Association is likely to pick up this work and see it through to adoption of the policy, thus providing a strong "exit strategy" for this aspect of the project's work.

7. Component 2 Results/ Effectiveness: Institutional - Biomass Support Unit

Component 2, the "Biomass Support Unit" (BSU) component, aimed to achieve the setting up of a sustainable one-stop shop where municipalities and others could go to get support for developing bioenergy projects. The original vision is that this one-stop shop would be based within a government agency, such as MAPF. Several stakeholders expressed to the TE team that this vision was highly impractical given the situation in Ukraine after the 2014 revolution. The explanation given is that the government lacks funds to pay additional staff for such a unit. Further, it was explained, government staff are not paid well, perhaps with salaries of USD 200 per month, and this would make it difficult to get persons with the necessary expertise to staff the unit. This section first reviews efforts to set up the BSU, then discusses the shift in strategy to setting up a cross-ministerial Biomass Working Group, as well as other activities budgeted under the component. It next discusses what might have been alternatives to "giving up" on the BSU as the project seems to have done and also alternative ways the team might have interpreted the project design by focusing on outcome statements. The TE team's general conclusion on the BSU component is that it floundered and was not very successful in achieving aims. There may have been a possibility to achieve more success on this component through creative thinking. In addition, if one looks at the outcome statements under this component, one of the two may be considered to have been partly achieved by capacity built within banks for biomass loans, though this work was included under Component 3's financial support mechanism work.

Efforts to set up the BSU: The project hired a national consultant to set up the BSU. A few other consultants, including one international one, were hired to support this effort. Efforts were made to reach out to the Ministry of Agriculture, where the unit was to be based, but the Ministry was not responsive at a high level. There was some success with the EU Integration Unit of the Ministry, but the project could

not get traction at the higher level needed to establish such a unit. The project was proposing that a unit be set up in the Ministry to address alternative uses of agricultural waste. Eventually, in other developments, the minister was removed and not replaced in a timely fashion, further stymying efforts. One stakeholder suggested high-level liaison between UNDP and the minister might have helped, but most seemed to think the idea of a BSU within a government ministry was doomed to fail from the start of the project. As a part of the BSU consultant's work, the project next became involved in the pre-existing Renewable Energy Working Group at SAEE. The group held four meetings on biomass, though the TE team was unable to confirm whether or not these were due to the initiative of the *Ukraine Municipal Bioenergy Project*. Based on the TE team's understanding of the institutional structure and interests of different ministries and agencies in Ukraine, it seems that SAEE might have been the better place to set up a BSU had setting up one within the government been viable. As another angle on the BSU, some consider that the project's roster of biomass consultants carrying out feasibility studies and technical designs are close to the vision of a biomass support unit in that they are developing real projects. Yet, the problem is that such a BSU has not been designed to be sustainable once project funding stops.

Biomass Working Group: Eventually, the project team in the first phase decided to change strategy and set up a Biomass Working Group. Instead of continuing its involvement with the biomass meetings of the Renewable Energy Working Group under SAEE, the project somehow decided to set up this cross-ministerial biomass group led by MENR. The meetings of this group were to be quarterly. A total of five meetings were held, three in 2017 and two in 2018. Three ministries were involved: (1) MENR, (2) Ministry of Regional Development, represented mainly by SAEE, and (3) Ministry of Agriculture, represented by the State Forestry Agency. A challenge is that this group seemed mainly to discuss forest-based biomass. It was explained to the TE team that MENR has a separate working group on waste and that it was felt agricultural waste – agri-biomass – should be discussed there. Obviously, this thinking was not a good fit for the project aims of promoting agri-bioenergy in municipalities nor, in light of projections by the Bioenergy Association, for the long term needs for expanding bioenergy resources in Ukraine, which will depend largely on agricultural wastes. Once the *Ukraine Municipal Bioenergy Project* stopped supporting the working group, it stopped meeting. The TE team does not think this was a mistake as sources indicate the working group did not really have concrete achievements and, as mentioned, it was focused on issues out of the main scope of the project. And, as with the policy work, the project team in its last 1.5 years needed to let this item go so as to be able to address the project pipeline work of Component 3, which was the most important remaining opportunity to contribute to achieving the project's objective. Finally, the TE team notes that a working group is clearly not the same as the one-stop shop envisioned by the project design, so that continued support of this group really did not address the original aim.

Also with regard to this new working group, a question should be asked of whether the bioenergy-focused meetings of the renewable energy working group under SAEE would have been a better venue for achieving progress related to project aims. Given that the new Bioenergy Working Group had a narrow scope (wood only) and given that SAEE appears to be the right government partner for bioenergy, the TE team would guess that resources might have been better spent in building bioenergy capacity in the working group under SAEE.

Lastly, despite the TE team's concern about lack of clear results of the MENR-led working group, a general result of government capacity built (such as targeted under the first outcome of the component) may have been achieved. An impressive finding is that, when BMU, the German Ministry of Environment, decided to provide support to Ukraine and approached its counterpart, MENR, for discussions, BMU also ended up speaking to the working group or a representative of it. In the end, for its upcoming environment related support in Ukraine, BMU decided with MENR that bioenergy will be the only specific renewable energy sector to get support. Plans call for a € 7 million allocation for bioenergy among other funds allocated to cross-sectoral initiatives. Thus, it may be concluded that MENR's

involvement in leading the Bioenergy Working group might have played a role in raising the profile of bioenergy in this important ministry.

Other work budgeted under Component 2: Some other activities that were included in the budget for Component 2 may have been more related to other components. On the other hand, the outcomes of the component reference capacity building, which might be interpreted broadly to encompass some of these activities. The activities mainly include a study tour to Sweden and a number of individual consultancies that appear mostly related to the policies and regional planning of the first component.

Alternatives to "giving up" on the BSU: Achievement of the project's BSU target, given the government situation, was clearly an extremely challenging endeavor. Yet, the TE team also sees a lack of effort on the part of the project to consider other more creative and out-of-the-box solutions. For adaptive management, it is important for projects, instead of declaring aims impossible, to look for ways in which they can respect the initial spirit or aim, even if some of the details much be changed. Then, in that light, the project may consider whether this new adjustment of the aim would be a useful thing to pursue in terms of the project objective. Could the project have considered setting up a BSU outside of the government? And, would such a BSU have been useful to the overall aim of promoting the development of municipal biomass? Such a non-government BSU would likely also have faced sustainability challenges once the project was closed and the BSU was no longer supported by project funds, but there may have been a way to develop a sustainability mechanism. Other UNDP-GEF projects have had some success in setting up organizations that become sustainable beyond the life of the project. These organizations must generate funds through their various activities to fund continued operation. Could the *Ukraine Municipal Bioenergy Project* have created such an organization, perhaps through cooperating with the Ukraine Bioenergy Association? Or, perhaps through having such a unit established based on agreement between the government and the association? Is there a way to sustain the roster of bioenergy consultants developed by the project, making them available perhaps on a for-fee basis? It seems that, at minimum, information on these consultants and their experience in developing municipal bioenergy projects could be posted online so that municipalities or private companies working with municipalities might in the future consider retaining their services.

Another alternative to the BSU was mentioned in the discussion of the financial services mechanism in Section 4 as originally having been proposed by the team carrying out FSM work. This alternative would be to develop an ongoing platform within the UNDP Ukraine CO to provide support to various entities, such as municipalities, on project development, including financing, in multiple priority areas such as, but not limited to, bioenergy. Such a unit would be meant to extend beyond the life of the project. It might be supported by different projects that engage it as time goes on, but may also charge minimal fees to clients. The rationale is that so many UNDP projects are trying to develop financing mechanisms and stimulate projects in desired areas that there might be a real benefit to having in place a long-term organization that does not need to "reinvent the wheel" with each new project. Such an organization may also play to UNDP's comparative advantage in addressing underserved areas, such as small and medium sized cities and their small and medium-sized projects.

Alternative interpretation of Component 2 design: Strictly speaking, the key means of judging progress towards targeted results is assessing results in light of the objective and outcome statements and their indicators. For Component 2, the "component statement" describes the biomass support unit. Strictly speaking, though, components are to be more like topics; and it is the outcome statements that should matter. According to this interpretation (see Exhibit 1 with the component and outcome statements for Component 2), the targets under Component 2 are really capacity within the government and capacity within banks. MAPF and DerzhZemBank are mentioned specifically, but ideally project design would be less specific and leave room for interpretation. Thus, it is reasonable to interpret these two outcomes to be about the building of capacity in the government and banking sector. As noted, the project did address the

second of these aims through its financial support mechanism work under Component 3. These outcome statements allow us to give the project slightly more credit for progress towards results under Component 2, though the ProDoc in discussing the component makes it clear that setting up of a "Sustainable Biomass Support Unit" is the main aim.

8. Component 4 Results/ Effectiveness: Awareness

A number of project activities (some a part of Component 4 and others a part of other components) contributed to raising awareness about the project's achievements and the potential of municipal bioenergy more generally. Overall, the TE team sees some good successes in this work. At the same time, there are lessons to be learned about developing a more strategic and cost effective approach. This section reviews the major activities of relevance and how they have contributed to results in the awareness area, possible lessons learned, and ways to build on achievements post-project to continue to build awareness.

The central work of the project in the last 1.5 years, while focused on developing a project pipeline through feasibility studies and technical designs as a part of Component 3, appears to have played a positive role in raising awareness. As noted, 35 municipalities and federations have been supported through this work and it is believed that awareness and capacity has been raised in all of them through their interactions with the consultants from the project's bioenergy expert roster. Even more cities have been involved as applicants; and there has been a special session for applicants at the last two annual Bioenergy Conferences. At the same time, as noted earlier, had time permitted, the call for applicants may have benefited from wider awareness building to get more of Ukraine's 450 cities and 850 new federations involved in the competition. While the project will be closing soon, an important opportunity for awareness raising that might be followed up upon in some way would be to document each of the pipeline projects with a brief one or two page case study. The result could then be combined with a lessons learned summary. Each case study may include the main details of the proposed project, investment amount and returns, and, if available, financing plans. A compendium of one or two-page case studies of the 48 pipeline municipal bioenergy projects, along with the lessons learned summary, could be a useful source for other cities considering involvement in the bioenergy sector. Nothing on the scale of what the project is doing in terms of number of cities and projects has been done before in municipal bioenergy in Ukraine. And, information about this extensive work should not be lost in the rush to complete the project.

The project has carried out two study tours, the first being a one-week study tour to Sweden in 2015 and the latter a domestic two-day study tour, carried out in March 2019. The TE team heard very positive reviews of the domestic study tour, including a couple of cases of clear impact, and recommends the project consider organizing a second domestic study tour, perhaps coordinated with a closing workshop, if time permits. As mentioned earlier, the municipality of Odessa has gotten seriously interested in biomass CHP as a result of the study tour and has developed a first biomass CHP project seeking foreign investment. And, Kharkiv Oblast participated in the study tour resulting in a suburb of Kupensk Municipality participating in the project's pipeline work. Also, the study tour cemented the interest of Vonznesensk Municipality's interest, the mayor of the city having attended the study tour after other interactions with the project. A domestic study tour is a low-cost and effective means of building awareness and interest among municipalities. Stakeholders noted that the best way for municipalities to see how bioenergy might be implemented in Ukraine would be to see Ukrainian cases of bioenergy projects, rather than going abroad to see projects that may be impractical in Ukraine. The TE team finds this approach of a domestic study tour to be one that may well be considered as a model for other projects. For some reason, it is always assumed that study tours should be international, but the experience of the project's domestic study tour shows otherwise. The two-day tour was attended by over

50 representatives of partner municipalities, media, and the national government. It resulted in media coverage and, as suggested by the foregoing examples, involvement of municipalities in bioenergy projects. The one-week international study tour in Sweden in 2015 had 17 participants including, but not limited to, national level and oblast level government officials. The TE team did not hear any comments about this study tour from any of the persons interviewed.

As has been noted, the project had a large awareness contract with a marketing company, MMKG, which was budgeted under Component 3, but really would have been more appropriately charged to Component 4, the awareness component. The original contract value was USD 753,649; and amount paid, given early cancellation, was USD 234,876. The TOR preparation, bidding, contracting, and any work that occurred on the assignment all took place under the first project team. The TOR for this assignment was developed over a long period of time, starting in June 2016 and a call for proposals was finally made in December 2016. The contract was not signed until the end of June 2017. At the time it was signed, the required budget revisions had not been approved by the RTA. Indeed, the budget revisions were never approved by the RTA. As a result of serious concerns about quality of delivery combined with the lack of approval for budget revisions, activities and payments under the contract were suspended on Dec. 20, 2017; and the contract was then cancelled in February 2018, with payments wrapped up by Feb. 8, 2018. The transition to a new project team occurred some months after this. The contract called for 338 bioenergy trainings of municipalities, 78 at the oblast (or regional) level and the rest at the rayon (or district) level. A flurry of trainings (and the only ones carried out under the contract) took place during just two weeks in December 2017, with 50 trainings being indicated by the contractor to have occurred during this period, all at the rayon level in two different oblasts, Zhytomyr and Cherkasy. The TE team sees a number of problems with this assignment: the number of trainings seems excessive, the trainings were not designed to emphasize the financing mechanism as promised, and the main contractor seemed to add a lot to the cost without value add. The main contractor subcontracted to REA, an organization with strong links to the Bioenergy Association. The REA team made up nine of the ten key persons listed in the contract and prepared all the brochures and training materials as required under the contract. The TE team did not find that the main contractor added much value to what REA provided and believes that contracting directly with REA might have been less than one-third the cost had that approach been taken. In general, an awareness contract of such a large value in a UNDP-GEF project of this size is surprising. Yet, the TE team found that a previous project, the UNDP-GEF *Ukraine Energy Efficient Lighting Project* had had similarly large awareness contracts, including one with MMKG for almost USD 800,000. The mid-term review of the lighting project had suggested it shift away from spending so much on awareness; and the terminal evaluation indicated that the project did not take the mid-term review's advice and continued to spend heavily on awareness. This trend of high contract value awareness contracts suggests the importance of assessing awareness strategies and costs for UNDP-GEF projects in Ukraine. On the one hand, awareness and training are critical areas. On the other, they are often lower-cost areas, where a lot of value can be derived with limited investment.

Consultations during the TE mission provide input on the number and quality of trainings and training materials associated with the large contract. Several stakeholders suggested that 338 trainings was an excessive number. Most felt that oblast level trainings would be enough and that the district level trainings were not needed, though some saw the value of reaching out at the district level. The idea of webinars was also raised. This was an approach used in the financial support mechanism work of IFC to relaunch municipal loans and was quite effective in attracting participants, with over 50 bankers attending one of the webinars. Feedback on the training materials associated with the large awareness contract and which were all prepared by REA was extremely positive. Indeed, some stakeholders were very enthusiastic and said they wished such quality materials were available for other renewable energy sectors. At the same time, some of the feedback on quality of the trainings was not very positive. In terms of who carried these trainings out, findings suggest REA conduced 12 of the 50 trainings (which took place in Zhytomyr Rayon), but it's not clear who carried out the other 38 trainings, given that 9 of the 10

key people in the main contract were part of the REA team. The final report provided by MMKG includes photos of the trainings. Some appear very sparsely attended with perhaps only five or five plus a few more persons in the audience.

The project could have really benefited from a well-designed, strategic, and cost-effective awareness raising and training program. Yet, given the shortcomings and lack of cost effectiveness associated with the 338 trainings contract, the TE team believes it was the right decision for UNDP to cancel the contract early. The lesson for future projects is that close attention must be paid to awareness and training strategies so that it is clear what the aim of such assignments will be. With the aim in mind, the appropriate type of parties to carry out training and awareness can be determined to ensure that (a) outreach is conducted to encourage suitable parties to compete for the assignment and (b) TOR requirements are not "over-designed" to favor more expensive companies who do not bring value-add. Lastly, cost-effective means for achieving awareness and training targets, such as webinars and/or consolidation of trainings at the oblast level, should be explored, determined, and adopted.

Other project activities related to awareness include sponsorship of conferences, the project website, and preparation of a municipal biomass guide. As for conferences, the TE team found that the project supported at least seven conferences spanning the years 2015, 2016, 2017, 2018, and 2019. Four of the conferences (with total contract value of USD 93,482) appear to be broader than bioenergy, addressing such topics as energy efficiency and renewable energy and investment in these. The other three conferences (with total contract value of USD 68,432) supported are focused on bioenergy and are the annual bioenergy conference of the Bioenergy Association. Given the challenges with achieving the targeted objective and outcomes, which are focused on bioenergy, the TE team believes it would have been more strategic for the project not to support the broader conferences. The project website has been developed and provides many materials developed under the project. Yet the exit strategy for the website (i.e. what will happen with it after project close) has not been determined. The TE team found that the Bioenergy Association had posted the brochures REA has prepared under the project on its website, which has a "useful materials" section. The project may wish to consider cooperation with the Association in getting other project materials posted on the Association's website as one possible exit strategy. The municipal biomass guide was prepared for the project by the same consultant that served as the national lead policy consultant. As noted, an earlier guide of high quality was prepared during the inception phase, though had a more technical angle. The TE team reviewed the later guide prepared during the project and found it to be acceptable, though did not hear of it being used by any stakeholders. This again raises the important point that studies and documents prepared by projects should be limited to those that the respective project will ensure are made good use of.

9. Cross-cutting Aspects of Results: GHG ERs, Sustainability of Results, Stakeholder Engagement, and Gender

This section covers areas related to results, but that may cut across components (sustainability, stakeholder engagement, and gender) or otherwise be better highlighted separately from the component discussions (GHG emission reductions).

GHG ERs: Given the greenhouse gas emissions reductions (GHG ERs) facilitated by replacing natural gas boilers with biomass boilers, the project is considered to have a strong positive climate change mitigation impact. While the burning of biomass does emit GHGs, in the case of agri-biomass, which is

the focus of this project, the net CO2 emissions are considered to be zero, as the agricultural crop (or energy plantation) is grown again with uptake of CO2 equivalent that emitted when the agri-biomass used in the boilers is burned. This "net zero" impact on GHG emissions would not be the case for wood biomass used in boilers if it is unsustainably harvested – that is, if the wood is harvested for use in boilers at a faster rate than it grows back.

Findings suggest that the project will roughly meet and quite possibly surpass GHG direct emission reduction (DER) targets, given strong expected post-project DERs of the pipeline of projects developed over the past 1.5 years. DERs during the project, however, may be less than targeted, because of the relatively late start in generating this project pipeline. Given the approach of the project in engaging such a large number of cities (35) in pipeline projects and emphasizing financial viability, along with the strong potential cost savings/ profitability of municipal bioenergy projects, replication is also expected to be strong, so that indirect emission reduction targets (using a bottom up approach with a five times replication factor) will also roughly be met. (Indirect emission reductions are also known as consequential emission reductions or CERs.) Exhibit 18 summarizes the project GHG ER targets as well as the expected GHG ER achievements at the time of the TE. In terms of targeted GHG ERs, the project's objective statement, results framework, and text of its CER each indicate different direct ER targets, though the differences are not too drastic. Here we use the targets indicated in the project's objective statement, which reads: "The objective of the project is to promote biomass-based municipal heat and hot water services. It will reduce direct GHG emissions by 63,577 tons of CO2 over its 4-year project life and 19,143 tons of CO2 during each year of the remaining 16-year life of the boiler equipment."

In terms of the expected direct ERs due to the pipeline projects, as noted in the discussion of Component 3, estimates are based on probability weightings. That is, a project that has 95% likelihood will contribute to the total 95% of the GHG ERs it is expected to have if implemented. Because there is one really large pipeline project (a CHP project) that is considered only 35% likely, our conservative estimate does not include this project at all. The reason is that, even with only 35% weighting, this project more than doubles the GHG ER estimate without it (i.e. 313,411 tons CO2 without CHP project versus 856,317 tons with). As such, the various other totals and subtotals of expected ERs exclude the CHP project. Yet, it is worth keeping in mind that if the CHP project is realized, the project's GHG DERs and likely its CERs will vastly exceed targets.

Exhibit 18. Targeted GHG ERs at Time of Project Design and Expected GHG ERs at Time of TE (in tons CO2 and USD)

Item	Direct ERs during project (A)	Direct post-project ERs (B)	Total direct ERs (A+B=C)	Indirect ERs (D)	Grand Total (C+D)	Cost per ton CO2 ER (direct only)*	Cost per ton CO2 ER (direct + indirect)
CER target	**63,577**	**306,288**	**369,865**	**1,465,110**	**1,834,975**	**$12.71**	**$2.56**
Pipeline projects -	---	---	Conservative: 313,411 Optimistic: 856,317	5x replication of conservative: 1,567,055	1,880,466 (conservative)	---	--
Avers boilers	---	---	61,600	0x replication	61,600	--	---
Total expected	**---**	**--**	**375,011 (conservative)**	**1,567,055**	**1,942,066 (conservative)**	**$12.53**	**$2.42**

*This item divides total GEF funds for the project of USD 4.7 million by tons of CO2 reduced.

Sustainability of results: Given that UNDP-GEF projects have a strong mandate to create sustainable results, such as demonstrations that are likely to be replicated, sustainability has been covered in the respective discussions of components above. Here, a short summary is offered. As for Component 1, policy and planning work is, by design, expected to have strong sustainability if only the great challenge of getting policies and plans adopted and implemented can be achieved. The project showed some weakness in its policy work by pursuing so many different avenues rather than focusing on a few critical ones. It is expected that the four adopted policies for which the project claims credit will be sustainable, though, as noted, the role of the project in getting these policies adopted in not clear. The energy crops policy work during the last year of the project has a good chance of sustainability despite its late start, as the Bioenergy Association will very likely take up the work and continue to advocate adoption of and then corresponding implementing regulations for the draft policy. As for the oblast-level plans, formal adoption of these plans is a positive achievement in terms of sustainability. Yet, as there has been no follow up work to ensure the plans will be implemented, there is a high risk that the plans will not, in the end, be meaningful and sustainable results.

For Component 2, as the one-stop shop was not achieved and as the closest thing to the one-stop shop, the bioenergy expert roster, is temporary, there is a high risk of lack of sustainability. Further, the Biomass Working Group set up under this component is no longer meeting. The project might have worked harder to figure out a way to have a sustainable one-stop shop or at minimum ensure that its bioenergy expert roster has some way of being continued in the future. There may be some simple approach the project can take in its last days to achieve a minimum level of sustainability, such as SAEE maintaining a list of qualified experts to share with cities and/or having some other kind of cooperation with qualified bioenergy experts. Or, another UNDP project could build on the experience of the roster, perhaps working with the Bioenergy Association, to ensure a long-term, sustainable platform for municipal bioenergy project development is set up.

Component 3 results appears to be the most sustainable of the four components. The project pipeline involving 35 cities has reached many people and is sure to stimulate additional replication projects. One concern, however, is that the lifetime indicated for many of the installed boilers is only 11 to 15 years. Higher quality biomass boilers should be able to last 20 years. Perhaps the bioenergy experts on the roster have found that returns are better if cheaper equipment with a shorter lifetime is used, but this is an issue that the project team may wish to look into and double check in terms of lifetime NPV of projects using equipment of different costs and lifetimes. The Avers straw pellet boilers procured earlier in the project are assessed to have less sustainability than the pipeline projects vis-à-vis replication. While the quality of these boilers seems good, so that they should last their expected lifetime, replication in Ukraine does not seem to be occurring due to the relatively high cost of the boilers. At the same time, their installation may have stimulated other types of bioenergy boiler activity. One concern about the Avers boilers is whether Avers will continue to be available to service them during their full lifetime. This might depend on whether Avers decides to remain in the boiler business, something that is not clear given the lack of evidence of sales beyond the project procurements. The FSM work, having re-launched municipal loans in Ukraine, appears to have achieved a sustainable and important result, though, as noted, more work needs to be done to ensure that medium and small cities benefit. As for the awareness raising of Component 4, it is believed that the project pipeline may be the most important aspect in sustaining awareness gained through other of the project's awareness raising activities, such as the domestic study tour or bioenergy conferences.

Stakeholder engagement: The TE team rates the project relatively highly in stakeholder engagement. During consultations, the TE team found the institutional beneficiaries, such as schools in which straw pellet boilers were installed, enthusiastic about their boilers and very knowledgeable about benefits. Most were able to quickly tell the TE team what kind of economic benefits they had achieved through lower fuel costs. The enthusiasm of municipalities for bioenergy and initiatives of the project was similarly very

high. Most are looking forward to expanding their activity in the bioenergy realm. With the work in developing a large project pipeline, the private sector is also getting involved. Private sector companies may have the funds to invest in municipal bioenergy projects, but may be hesitant to invest the smaller amounts needed up front for feasibility studies and design work. Thus, the project pipeline work helps stimulate them to commit to investing in projects once design work is done. The TE team also noted enthusiasm in the banking sector for the relaunch of municipal loans and for municipalities as banking clients. At the national level, the TE team found enthusiasm from certain arms of the government such as SAEE and MENR. SAEE in particular appears highly engaged in the pipeline project work and is considering posting these projects on its website, once they are reviewed internally for viability. MAPF was not available to meet the TE team and this probably reflects its ongoing disinterest in the project.

Gender: The TE team did not find that the project had expended specific effort in addressing gender issues, though was glad to see a number of talented women involved in the project. With regard to gender, the project's CER states:

"Moreover, the project will seek to achieve gender equality through the empowerment of women to fully participate in all project activities and specifically those related to capacity development under the various components. This will be achieved through working, for example, with NGOs like 'Krona', the Ukrainian Women's Fund, La-Strada, School of Equal Opportunities, All-Ukrainian Women Centre of Information and Social-Economic Adaptation, etc."

In the end, the project did not work with the aforementioned NGOs. Yet, the TE team believes the more important way to promote gender would have been through participation of women in project opportunities. In this regard, the project may have still fallen short. For example, review of the list of 17 participants on the 2015 study tour to Sweden indicate that only two participants were women. This seems an example of a classic opportunity missed to promote gender mainstreaming and indicative of a lack of attention to gender when it comes to the best opportunities of the project. In the first three years of the project, most of the larger IC contracts were with men, though the first CTA and the consultant assisting with project reporting, TOR preparation and editing, were women, as was the consultant responsible for assisting the lead policy consultant in preparing legislation in required format. The current consultant team shows some improvements in having women in leading positions, though the bioenergy expert roster is largely male, which may be due to the sector being largely a male one. The TE team is happy to see that two of the three consultants assisting cities in getting detailed technical design done are women, including the lead consultant in this area. Further, the current policy consultant is a highly capable woman with an excellent background in bioenergy policy, perfect for the task at hand. UNDP CO also has a good representation of women including the lead quality assurance person on the project and the lead of M&E. Yet, UNDP may wish to work on cultivating more women as project managers of its projects. Indeed, finding quality and high integrity persons for the project manager role is considered a challenge, so that cultivating more talented and high integrity women for the role could be a way to address the gap.

10. Assessment of Design, Implementation, and M&E

Assessment of design with the benefit of hindsight: The project design is introduced in Sub-section 1.1. With the benefit of hindsight provided by the challenges observed in implementation of the project's various components and activities, some assessment of the design may be made and corresponding lessons learned delineated. Overall, some of the project's components and outcome statements could have been stated more broadly to allow the flexibility needed to deal with the specific country situation at the time of implementation. Further, while project implementers had the responsibility of employing adaptive management, this process may have been assisted by ProDoc activity descriptions that mentioned some of

the possible options of approaches for various components and outcomes. The design of the project's focus, objective, components and outcomes, and associated activities is discussed in this sub-section.

As for focus, Sub-section 2.1, which addresses relevance, finds the project's focus on agri-biomass for municipal bioenergy is quite relevant and needed. While bioenergy in general should be supported, the project design has found a niche in need of support by focusing on municipal biomass, which is overlooked, and agri-biomass, which is destined to be the growth area of the future, but which clearly needs more support than wood biomass. The objective statement is also considered suitable, but to have been clearer, it may have indicated "agri-biomass" or, to ensure energy crops were encompassed, may have indicated "non-wood" or "agri-biomass and energy crops." A shortcoming in focus that has been mentioned is that the ProDoc as written focuses predominantly on straw from cereal crops, even though the greater potential for the long-run is considered to be corn husk. In general, a more diversified focus on non-forest biomass or on agri-biomass and energy crops may have been more appropriate.

The design of Component 3, which focuses on investments in biomass and has the largest share of the project GEF budget (USD 3.25 million or 69% of GEF funds) might have been handled differently at the component statement and outcome statement level. As currently stated, these imply that the component is all about the financial support mechanism. Yet, making the full pipeline of projects dependent on the establishment of the financial support mechanism is quite risky, as the project would take time to set up such a mechanism, unless the mechanism were given a broader definition. While the project has used adaptive management to address this issue, ideally, the component and its outcome (or one of two outcomes) would have been stated more generally, such as "investments in bioenergy" or "investments in bioenergy supported by various financing channels." Then, unless the financial support mechanism were defined more broadly, to include not only loans, but also municipal budgets and private sector investment, the FSM might become a second outcome under the component and one that is allocated a much smaller budget. In that way, the larger budget associated with investment of the first outcome could have more appropriately supported feasibility studies and technical design, as well as limited grants, while the second outcome, with much smaller TA budget, could have supported the establishment of the FSM, so that loans could be a kind of leverage to the investments made under the first outcome. The text describing the activities could have emphasized the financial support mechanism as a loan mechanism, but might also have indicated that funds may come from other channels, such as the private sector and municipal budgets. Further, the project could have had some activity to ensure that these alternate sources of funding were as active as possible. This may have included TA to increase involvement of the private sector in investing in municipal bioenergy projects and work to encourage municipalities to allocate municipal budgets to such projects. As a final note, while it was a significant shortcoming of the project's early implementation to provide full funding for the procurement and installation of 12 boilers, the ProDoc might have anticipated possible challenges in deploying the first boilers with only 25% grant and allowed for only one or two of these to be fully supported by the project as demonstrations, before moving to the scheme with either no grant or maximum 25% grant. Still, if the design were to have allowed one or two grant boilers, it would also have been important to require that these demonstrate financial viability (i.e. good return on investment) so they could have been replicated.

As for Component 2, with hindsight, the design may have been handled in a different way. While the component statement about the biomass support unit is fairly general, the outcome statements are very specific. The first refers to MAPF, which is a problem in that MAPF lost interest in the project early on. The second refers to the DerzhZhemBank, which was disbanded shortly after project launch. With hindsight of the challenges of establishing a one-stop shop within a government organization, the project design may have chosen to explain a broader interpretation of the one-stop shop. Options outside of the government could have been discussed in the design. In addition, how to make such a unit sustainable should also have been discussed in the design. There is some confusion as the component statement refers to the BSU, but the outcome statements refer only to capacity building. In general, one option to consider

for future project designs is to make the component statements more like topics and then to carefully design the outcome statements to clearly reflect the intended result. That is, in this case, is the intended result a biomass support unit, or is it capacity built?

As for Component 1, in retrospect, the design may have kept the project team more on track by conducting a policy needs analysis during the PPG to determine which policies/ policy areas would be most important for promoting municipal agro-biomass and then delineating a small group of key target policies to develop and get adopted. The design may have also required that policy work be focused more squarely on biomass. As for the oblast-level plans, the project design might have included specific activities related to follow up guidance and implementation support for these plans.

As for Component 4, the design may have included a municipal training/ awareness program and been very specific about what kind of trainings/ awareness work were to be included and what the aim of these would be. The awareness design should have designated that the focus should be squarely on agri-biomass. And, given that financing is the key barrier to municipal biomass project implementation, the design could have more clearly emphasized the need to train municipalities in proactively getting their bioenergy projects funded, something that could have been coordinated closely with the project's financial support mechanism work.

An issue that cuts across components is that, as commented by a number of stakeholders, the project focused mostly on biomass boilers, whereas there is a still a need to develop the supply chain for agri-biomass. This might include a biomass exchange and/or methods of quality control and certification of biomass. While the project conducted two studies on pellets (one on pellet quality and one on the pellet market), what was really needed was action-oriented work that impacted the development of the biomass supply chain, both pellets and non-pellets and particularly agri-biomass and energy crops.

Finally, regarding environmental and social safeguards, the project design might have included a more thorough environmental and social screening assessment and incorporated local air quality concerns (with regard to biomass boilers) into its activities and monitoring. As for the assessment, the TE team reviewed ProDoc Annex 7: Environmental and Social Screening Summary and were surprised at its brevity. The Annex includes the Summary itself (about 1.5 pages) and also an Environmental and Social Screening Checklist (a little over one page). The Summary is simply a form including several categories and the only information specific to the project that is provided is a check mark under Category 1, which is defined as "no further action needed." The Checklist is a form of seven questions, all of which are answered with a simple "Yes." The TE team believes that a much more extensive questionnaire, such as UNDP is now using for its design of UNDP-GEF projects and which requires the designers to write out much more detailed answers/ explanations as well as go through a much more extensive list of questions, is preferable. It's possible the project did fill out a more detailed questionnaire at the PIF stage, though no social and environmental screening annex to the PIF was found. As for concerns about the impact of biomass boilers on local air quality, the TE team received feedback from some stakeholders that bioenergy boiler projects can sometimes be of concern in this regard and, for that reason, may not be suitable to city center or crowded areas with tall apartment buildings. While none of the project demos were said to cause local air quality problems, a project promoting the adoption of biomass boilers on such a large scale would have done better to address the issue of local air quality. This may have included two aspects: (1) carrying out assessments to ensure biomass boilers result in no worse air quality conditions than gas boilers and (2) monitoring the project demos for air quality issues.

Assessment of implementation: In light of findings with regard to the first phase of the project (first 3.5 years), the TE team sees some room for improvement and some related lessons learned in implementation. As noted in Sub-section 1.4, there were issues of concern related to both the Project Board and government partner selection during the first phase. In the future, the UNDP CO may want to

develop clearer guidelines for who will be members of the project board and how the project board will make binding decisions about the project. As for government partners, not getting the partner quite right in its first phase may have reduced the success of the project. Given overlapping responsibilities or at least overlapping sectoral scope among various government entities, future projects should do a comparative assessment of relevant government partners to determine which is most promising as a partner in terms of achieving the project objective and outcomes. Hindsight also suggests that the project could have done better had the RTA's guidance been given more weight in decision-making. Findings suggest he early on raised concerns related to key issues identified in this evaluation (such as very strong statements regarding the 100% grant boiler procurements as early as the first PIR in July 2015), but this did not change the course of implementation until 3.5 years into the project. In general, identifying problems with projects can really benefit from the input of someone who is an expert on the project content, as the RTA is. Audit work can miss problems that content-oriented persons may identify. Relatedly, UNDP CO leadership may be less familiar with the priorities for GEF projects and how they work. A simple briefing for CO leadership, such as a two-pager explaining how the success of GEF projects is measured, typical approaches, and special rules to be aware of (such as not shifting too much money between components and the necessity of RTA approval of major budget changes) may be useful to improve the way in which the RTA and UNDP-GEF generally interfaces with UNDP CO leadership in guiding projects. Having these points in writing and giving them some prominence in the relationship may be a good way to ensure that UNDP-GEF projects focus on their most important intended results and that the UNDP-GEF and CO interface remains effective, so that valuable expertise from UNDP-GEF colleagues is leveraged. There may need to be a different two-pager (or at least one page being different) for different GEF focal areas, such as climate change mitigation, biodiversity, land degradation, etc. Lastly, in terms of implementation processes, experience of this project suggests that procurement could be improved. Greater effort could be expended to encourage the most qualified applicants to apply and more effort is needed to ensure that TORs are well-designed to achieve project targets and to ensure that procurement is cost-effective. Indeed, procurement may need to institute improved work in estimating costs to ensure that bids are not uniformly inflated. Further, evaluation panel members should include technically qualified subject matter experts and/or persons that understand the aims of the respective project well, including participants from regional offices or headquarters for all large procurements.

Assessment of M&E: On the surface, the project M&E processes appear to be well in place. Under the first project team, a consultant was hired at 50% time to provide support in project reporting along with support for editing reports and preparing TORs. In retrospect, the TE team believes it would have been better to do such work in-house, as involvement of the project manager in preparing monitoring reports may have been useful in making him intimately familiar with the project targets and project progress. One stakeholder commented that the reporting for this first phase of the project was especially good. In the TE team's view, however, this "good reporting" does not match with quality implementation or even real quality M&E. M&E processes need to include stronger oversight of procurement – including oversight of the following steps: preparation of TORs, outreach to prospective applicants, estimate of reasonable prices, and actual bid evaluation. A content-oriented person outside the project should periodically be evaluating what the project is doing and particularly how it is spending money. A useful tool may be a listing by component of individual consultant contracts and contracts with organizations, including contract topic and contract size. If a good template is prepared for organizing these contracts by component and if it can be filled in and updated periodically, this tool may provide insights on-demand of "where the money is going" without having to wait for the mid-term review or terminal evaluation.

The project carried out a mid-term review (MTR), the final report for which was submitted in March 2017 and included ten recommendations. The TE team finds that the new project team, beginning with strategy work starting in April 2018 during the project's interim period and then with relaunch and implementation in the project's last 1.5 years, followed through well on some of the most significant recommendations. For example, the MTR recommended the project shift from a full subsidy model (in

which 12 straw pellet boilers were procured by the project) to a TA support model. And, as indicated, the project in its last 1.5 years has shifted a large portion of Component 3 funding to support for feasibility studies and technical design. The MTR also recommended a project extension to end of December 2019. This was eventually pursued and secured, once the requirements of the RTA, mentioned earlier in this report, were met. And, the MTR recommended intensifying cooperation with key partners. This has truly been realized in the extensive cooperation with the Ukraine Bioenergy Association in retaining its members/ staff to constitute the project's bioenergy roster over the project's last 1.5 years. That recommendation also mentioned increased cooperation with the Ukrainian Pellet Union, an area in which the TE team did not detect much progress. Finally, the MTR had recommended an outreach program to increase awareness of the project's financial support mechanism. As noted earlier in this report, there were problems with an extensive awareness/ training contract signed after the MTR (in June 2017), which was later cancelled, a move that the TE team believes was appropriate. The work under that awareness contract was not well-linked with promotion of the project's financial support mechanism, although this was a requirement of the TOR and what was recommended in the MTR Report. Thus, this recommendation was not directly met. The extensive pipeline project work during the project's last 1.5 years did serve a dual purpose of extensive awareness raising among municipalities about municipal biomass projects and their financial viability, as 35 cities were involved in this work. Yet, there has been no extensive promotion to municipalities of municipal loans for bioenergy project financing.

11. Cost Effectiveness ("Efficiency"): Expenditure Analysis and Co-Financing

Findings indicate lack of cost effectiveness and lack of strategies to mobilize co-financing via stimulation of agri-biomass municipal boiler projects in the first 3.5 years of implementation. Following the 0.5 year interim period, in the last 1.5 years of implementation, a highly cost-effective strategy was implemented. The approach stimulated much stronger mobilization of non-project financing in municipal agri-biomass boilers. Yet, due to the short timeline, the majority of this outside financing will not be realized until after project close. While it thus cannot be recognized as "project co-financing realized" by strict definition, the mobilized financing might be tracked in the coming few years as a further means of understanding the effectiveness and impact of the approach adopted by the project in its last 1.5 years.

Expenditure analysis and cost effectiveness: Exhibit 19 shows project annual and total to date (as of Nov. 30, 2019) expenditures by component based on UNDP CDRs, which are considered the most accurate accounting of project expenditures. This is just one month before project close. Interestingly, most of the components show 80+% or 90+% of the allocated amount has been spent, except for Component 4, the awareness component. Yet, had the large training and awareness contract (even though cancelled early) been charged to this component, the component would have been completely spent with overage. This explains why the contract was put in the investment component – there simply was not enough money by far in the awareness component to cover the contract's full value of over USD 753,649. Movement of more than 10% of project GEF funds between components or outcomes requires GEF approval. Exhibit 19 shows the largest annual expenditures of the project have been in 2015 and 2016, likely, in part, because those are the years in which the majority of Avers boilers were installed. The bottom row of Exhibit 19 shows that expenditures were roughly on target with ProDoc design in 2015 and 2016, though got behind target in 2017 and 2018, as the project struggled with direction and then had an interim period, roughly Jan. - June, 2018, with the new strategy developed starting in April 2018, for relaunch around July 2018.

Exhibit 19. Official Annual and to Date Expenditures by Component based on UNDP CDRs (USD)

Component	2014	2015	2016	2017	2018	2019 *(to Nov. 30)*	Total all Years	Targeted	% Targeted Spent
Component 1	14,407	117,784	111,437	50,408	26,287	0	320,324	*370,000*	87%
Component 2	11,000	94,427	128,183	45,873	84,281	21,170	384,933	*460,000*	84%
Component 3	0	883,111	817,614	529,879	376,084	486,378	3,093,066	*3,250,000*	95%
Component 4	215	66,597	101,549	50,272	10,769	46,237	275,640	*400,000*	69%
PM	10,625	64,333	72,895	28,013	27,209	2,942	206,017	*220,000*	94%
Other*	63	251	251	251	210	211	1,236	---	--
Total	**36,310**	**1,226,502**	**1,231,930**	**704,695**	**524,840**	**556,939**	**4,281,216**	***4,700,000***	**91%**
ProDoc target†	---	1,206,250	1,331,250	1,161,250	1,001,250	---	4,700,000	---	---

*Other includes depreciation

†ProDoc target sub-totals are by implementation year, including "Year 1," "Year 2," "Year 3," and "Year 4." As the project started in June 2014 and had such low expenditures that year, for ease of comparability, "Year 1" target is given under 2015, "Year 2" under 2016, "Year 3" under 2017 and "Year 4" under 2018.

The M&E budget presented in the ProDoc calls for annual audits with USD 3,000 budgeted per annual audit. The TE team was not provided with audit documents and was told that audits had not been conducted.

Exhibits 20 – 23 show individual and organization contracts (the latter including only those of USD 10,000 or more) with the project by amount paid. These are organized by component as the items were charged to the project budget and not necessarily as the TE team would conceptually organize the contracts. As the simplest example, the MMKG contract, the awareness contract, might, conceptually have been included in Component 4, but, as it was charged to Component 3, it is shown there. Separate contracts on similar topics may be aggregated. Some takeaways related to these exhibits have already been discussed in the text. For example, with regard to the policy component, it was noted that there are many small contracts with a large number of consultants. This seems to correlate with a lack of focus of the policy component in the project's first three years. The TE team recommends use of such tables, particularly if a means is available to generate them automatically, to monitor and ensure that projects are going in the right direction. They can be used to generally check where most or at least much of the money is going.

The planned budget in the ProDoc is at the outcome level, making it difficult to determine if all substantial expenditures are in line with those planned. Yet, the brief budget notes in the ProDoc are informative. Component 3, which has a USD 3.25 M budget has USD 3 million allocated to "investment support" described in the relevant budget note as "support for feasibility studies, business plans, and investment." The CER indicates the USD 3.25 M of Component 3 funds are to be classified as "INV" – thus to be used for investment or feasibility studies and plans to support investment. As noted, the first 3.5 years of the project, the focus was on simple procurements rather than using feasibility studies, business plans, and a maximum of 25% grant to mobilize outside investment. Also, the large USD 753,649 awareness contract calling for 338 trainings was arranged by the project to be charged to this component. Looking at the awareness component (Component 4), the ProDoc budget shows just USD 140,000 allocated for "outreach program and lessons learned," showing the strong deviation of this contract for the designed budget. In the end, though the contract was cancelled, USD 234,876 in payments for the awareness/ training contract were charged to the "INV" component (Component 3) as was a USD 129,800 NGO grant for a study on pellet quality and USD 47,502 toward another NGO grant for developing an energy efficiency monitoring system. These NGO grants, like the awareness/ training work are quite different from direct support for feasibility studies to promote investments. The last 1.5 years of implementation provided a positive shift in this regard, as extensive work was carried out under Component 3 to directly support and stimulate specific investment projects.

Exhibit 20. Component 1 (Policy and Plans) Contracts

Contractor/ Topic	Year/Years	Amount Paid (USD)
Organization Contracts		
Ukraine Nature Protection Society: Study on Legislation Related to Bioenergy	2015	38,478
TOV Arena Koferentsiyi Ta Seminary: Arrangements for Inception Workshop	2014	12,156
Individual Consultants (IC) Contracts		
Lead National Policy Consultant	2015-2018	89,000
ICs working on national policy (10 consultants @$3800-4900 each)	2015-2016	44,850
ICs working on oblast plans (21 consultants @$1000-1500 each)	2015-2016	24,000
CTA	2016-2018	18,900
Consultant supporting lead policy consultant in preparing formatted legislation	2015-2017	16,580
ICs working on analytical reports or methodologies (2 consultants @≈4900 each)	2015-2016	9,820
Total of all IC contracts plus organization contracts >= USD 10,000	**---**	**253,784**
Comparison to component spending to Nov. 30 2019	---	*320,324*

Exhibit 21. Component 2 (Biomass Support Unit) Contracts

Contractor/ Topic	Year/Years	Amount Paid (USD)
Organization Contracts		
TOV Arena Koferentsiyi Ta Seminary: Arrangements for Sweden Study Tour	2015	27,999
Individual Consultants (IC) Contracts		
CTA	2018-2019	79,200
Biomass Support Unit Consultant	2015-2016	28,800
IC's working on various topics (7 consultants @3,000-4,500 each)	2015-2018	27,215
Biomass Working Group Consultant	2017-2018	16,320
MTR Consultant	2016-2017	13,850
International Consultant for Biomass Support Unit	2016	5,600
Total of all IC contracts plus organization contracts >= USD 10,000	**---**	**198,984**
Comparison to component spending to Nov. 30 2019	---	*384,933*

Possible cost effectiveness problems with regard to a number of these contracts have been raised previously in this report. One takeaway is that UNDP CO and project teams may need to do more in determining what is the lowest/best, reasonable price for quality work or quality product in the area desired. Regarding the straw pellet boiler procurement contract, because the cost of the boilers seems quite high, the TE team gathered market information and indeed found that it's possible that the project paid almost twice the real price needed for these boilers. Information gathered and estimates are provided in Exhibit 24. Information on the pricing of Avers boilers now available on the market is included for the company's Generation 2 (300 to 400 kW) and Generation 3 (500 kW) models. We then extrapolate the price per kW for the Generation 1 boilers procured by the project. The caveat is that the market info gathered is for today's market prices. The extrapolation does allow for a generously higher price per kW as the price per kW of such boilers is known to go down as boiler size increases. The finding suggests a "real" price with VAT of USD 66,000 for the Generation 1 boilers instead of the USD 129,000 with VAT in the contract. In the end, the project got VAT for purchases in 2015 refunded. This does not affect the analysis much, however, as the prices and estimates in Exhibit 25 include VAT of 20%. With no VAT, the price of the boilers purchased by the project was USD 107,500, while the extrapolated market price would be USD 55,000. Beyond the problem that the project may have overpaid substantially for these boilers, the other aspect of low cost effectiveness with regard to this contract is that these boiler installations were not replicated at all in the municipal sector. Replication elsewhere was not confirmed.

Exhibit 22. Component 3 (Biomass Investments) Contracts

Contractor/ Topic	Year/Years	*Amount Paid (USD)
Organization Contracts		
Aver-Tech: 12 straw pellet boilers and installation (note: some VAT refunded)	2015-2018	1,359,915
IFC: TA to support re-launch of municipal loans; training of banks	2017-2018	254,583
MMKG: cancelled awareness contract (brochures, 50 trainings, compensation)	2017-2018	234,876
Grants to 3 NGOs, each for planting 5 ha willow and promotion (@≈48,000 each)	2016	144,234
Novyi Svit NGO: Biomass pellet quality study	2015-2016	129,800
Analytical Center NGO – EE Monitoring (loan to other project not repaid)	2015-2017	47,502
Biomassa NTC – Study of Ukrainian Pellet Market	2016	32,000
Biomassa NTC – Study of Ukrainian Boiler Market	2016	25,000
TOV Arena Koferentsiyi Ta Seminary: Two biomass conferences	2017-2018	40,274
TOV Arena Koferentsiyi Ta Seminary: EE School conference	2017	32,680
TOV Arena Koferentsiyi Ta Seminary: Domestic study tour	2019	13,724
Individual Consultants (IC) Contracts (other than Biomass Expert Roster)		
International Financial Support Mechanism Consultant	2015-2019	67,350
ICs on various topics (10 persons @1500-4900 each)	2015-2017	38,550
CTA	2018-2019	25,300
Biomass Expert Roster ICs (last 1.5 years of project)*		
Feasibility study experts (9 experts @6,250 – 20,000 each)	2018-2019	165,450
Technical design experts (3 experts @16,150-19,000 each)	2018-2019	52,750
Expert and team lead	2018-2019	42,500
Policy expert	2019	16,000
Total of all IC contracts plus organization contracts >= USD 10,000	---	**2,722,488**
Comparison to component spending to Nov. 30 2019	---	*3,093,066*

*Amount for biomass roster consultants is contract amount to be paid by year end rather than amount paid to date.

Exhibit 23. Component 4 (Awareness) Contracts

Contractor/ Topic	Year/Years	Amount Paid (USD)
Organization Contracts		
TOV Arena Koferentsiyi Ta Seminary: 2 general renewable energy conferences	2015-2016	50,407
TOV Arena Koferentsiyi Ta Seminary: 1 bioenergy conference	2019	25,711
PAT "Kyi avia": general renewable energy conference	2019	10,398
Individual Consultants (IC) Contracts		
IC supporting project reporting,	2016-2018	31,200
IC for municipal biomass guide	2016	25,000
Lead expert on dissemination	2015-2016	6,400
Report on best practices in Ukraine municipal bioenergy	2015	4,850
Website IC	2016-2017	4,800
Total of all IC contracts plus organization contracts >= USD 10,000	**---**	**159,766**
Comparison to component spending to Nov. 30 2019	---	*275,640*

Highlights of other cost effectiveness issues raised earlier in the text include: (1) The MMKG awareness/ training contract of USD 753,649, which was eventually cancelled, raises serious cost effectiveness concerns. This contract called for 338 trainings, which were many more than should have been carried out for optimal cost effectiveness. Moreover, the original contract, if carried out directly with the right party may have been one-third or less of the contract price. This is based on findings that the vast majority of key personnel for the contract were affiliated with a sub-contractor with reported sub-contract value

around 12% of total contract value. (2) NGO grant contracts also raise questions about cost effectiveness. For around USD 50,000 each, three NGOs carried out development of energy plantation of 5 ha each. Local sources suggest plantation planting costs of around USD 1,000 per ha; and international comparison suggests a maximum of around USD 2,000 to 3,000 per ha. Thus total plantation costs, the main cost component of these grants, might be around USD 5,000 or at maximum USD 15,000. The NGOs carried out other activities in addition to planting, but it still seems likely the grants are not cost effective. Another grant, for around USD 47,500 went to an NGO as a loan for another project (on developing an energy efficiency monitoring system), but was never repaid by the other project. And, a grant of around USD 129,000 for a study on biomass pellet quality seems quite large for a grant and also large in terms of the topic. The nature of the study also raises questions of why the competition was not opened to the private sector. (3) Finally, the IFC work, for which USD 254,583 was paid, is considered high quality work and, combined with the work of the international financial support mechanism consultant led to the achievement of the re-launch of municipal loans in Ukraine. Yet, the work may have been higher value add if action oriented results were emphasized in the agreement with IFC, rather than more passive assessment and report preparation. (4) In general, cost effectiveness for much of the consultancy work of the project could be raised, if pure report writing is minimized and a more limited number of reports and other items drafted are integrated with work to achieve true results on the ground, such as bioenergy installations and their supply chains.

Exhibit 24. Price per kW and Total Price per Boiler of Aver-Tech Boilers (with VAT)
Comparison of Prices Extrapolated from Market Info to Prices in Project Contract for Generation 1 Boilers

Item	**Generation 3 – 500 kW – *based on market info***		**Generation 2 – 300-400 kW – *based on market info***		**Generation 1 – 220 kW-extrapolated from market info**		**Generation 1 – 220 kW - contract with project**	
	Per kW	Total	Per kW	Total *(for 300 kW)*	Per kW	Total per boiler	Per kW	Total per boiler
Boiler	$170/ kW	$85,000	$216/kW	$65,000	--	--	--	--
Installation	$34/ kW	$17,000	$50/kW	$15,000	--	--	--	--
Total	$204/ kW	$102,000	$266/kW	$80,000	$300/kW	$66,000	$586/kW	$129,000
Implications for Full Contract								
Extrapolated Market Price for 12 Aver-Tech 220 kW Straw Pellet Boilers				**UNDP Purchase Price for 12 AverTech 220 kW Straw Pellet Boilers**				
<=$66,000 x 12 = $792,000 maximum with VAT <=$55,000 x 12 = $660,000 max without VAT				$129,000 x 12 = $1.548 million $107,500 x 12 = $1.290 million without VAT*				

*In the end, VAT for 2015 was refunded but not for other years. The result is that total amount paid for the 12 boilers and their installation was USD 1,359,915.

Co-financing: Committed co-financing for the project at the time of approval as indicated in the CER (CEO Endorsement Request) is USD 30,057,500, which is about 6.4 times the GEF financing of USD 4,700,000, roughly in-line with the typical GEF aim to leverage 7 times the funds invested. To preface findings on co-financing, it should be noted that for UNDP-GEF co-financing reported amounts are typically not carefully tracked and never audited.[9] Thus, reports depend on partners' willingness to provide this information and a project's proactive-ness in collecting it. MTR and TE assessment of reported co-financing amounts, then, must depend on findings from consultations (e.g. did stakeholders confirm the co-financing amounts indicated?) and findings in documentation and from analysis (e.g. was a breakdown of co-financing provided and does it make sense, given the activity?).

[9] This is in contrast with GCF (Green Climate Fund) projects where attempts are being made to track co-financing more carefully. GCF is a much newer funding source than GEF and benefits from the experience of GEF.

Exhibit 25 shows the estimated co-financing that is directly related to project-influenced investment/ installation projects – including boiler projects and energy plantations. It also shows the amount expected to be mobilized after the project from the current biomass boiler pipeline (including boiler projects and a few energy plantations and briquette lines). It separates the amounts into (i) that realized the first 3.5 years of the project (USD236,692), (ii) that realized the last 1.5 years of the project (USD1,646,800) and (iii) that expected to be mobilized post-project by the project pipeline developed during the last 1.5 years of the project using weighted probabilities for realization of projects (USD3,833,664 – conservative estimate, excluding the one CHP project in the pipeline, which has very large expected investment; USD 16,084,366 – optimistic estimate, including the CHP project, weighted by its 35% probability of being realized). In all, for investment projects, considering both co-financing during project and the conservative post-project financing mobilization estimate, the total financing mobilized for investment projects and installations directly influenced by the project is 5,717,156, which is 3.3 times the project investment in the same investment projects (not including feasibility studies and designs supported by the project). With the optimistic post-project estimate, the total becomes 17,967,858 or 10.4 times the project investment in these investment projects (not including feasibility studies and designs supported by the project).

The TE team assesses that the co-financing mobilized for investments and installations directly stimulated by the project during the first 3.5 years of the project is less than should have been achieved given targets and also lower than reported. The amounts included in Exhibit 25 for this period are revised estimates by the TE team. Co-financing for investment projects/ installations directly stimulated by the project in the first stage of the project was extremely limited, because the project focused on an approach of using GEF funds to cover 100% of boiler procurement and installation costs, and also because funding of NGO energy crop efforts was quite generous, given the small area planted. In general, the TE team finds that the project strategy in its first phase was quite weak in terms of working to stimulate co-financing in investment projects stimulated by the project, whereas a more sustainable strategy, as pursued in the second phase of the project, would have emphasized using limited project funds to stimulate investment of financially viable projects. At the same time, it should be acknowledged that the targeted co-financing amounts are quite ambitious, given the situation of municipal budgets in Ukraine. Further, it should be noted that the USD 1 million loan to Uman for bioenergy projects, which occurred in Sept. 2018, is believed to have been largely influenced by work during the first phase of the project. And, it is also acknowledged (as explained further below) that co-financing amounts may include cash and in-kind amounts less directly tied to specific activities of the project. The TE team learned that co-financing amounts for both the boilers and plantations during the project's first phase were provided by the project team to the MTR consultant on a site-by-site basis, but that no other breakdown of amounts or evidence was provided. Based on consultations in the field, the TE team believes the straw pellet boiler co-financing during the first phase is a maximum of 15% total financing for the first ten sites and more limited (perhaps 5%) for the last two sites, whereas these were generally indicated to be around 30% in information provided to the MTR consultant. As for the plantations, the level is also estimated by the TE team to be about 15%, where it is indicated to be around 40% in information provided during the MTR.

Similar to findings in other areas, the TE team finds that the last 1.5 years of the project has been much stronger in terms of strategy for mobilizing co-financing, as it is providing funds for feasibility studies and detailed technical design, while full financing for pipeline projects will generally come from other sources. The exceptions of this 100% outside financing of investments among the 48 pipeline projects are four projects that will receive partial grant funding. One of these projects is a very small project receiving quite a small grant of USD 5,200. The other three are receiving project funds that equal no more than 30% of project investment costs. Projected total financing of the pipeline developed during the last 1.5 years of the project, including that expected to be realized both before and after project close, using the weighted probability for realization of the various pipeline projects, yields USD 16,711,971 with inclusion of the CHP project weighted at 35% and USD 4,461,264 without inclusion of the large CHP

Exhibit 25. Project Estimated Co-financing for Directly-Related Investments (USD) – Realized and Amount Expected to be Mobilized after Project

Item for which there was co-financing	GEF Financing*	Co-financing	Explanation on co-financing amount
First 3.5 years of Project			
1. Uman – 3 straw pellet boilers (220 kW each)	339,978	59,976	15% of total investment as indicated by stakeholders
2. Zhytomyr – 4 straw pellet boilers (220 kW each)	453,304	79,995	15% of total investment as indicated by stakeholders
3. Kyiv Nature Center – 3 straw pellet boilers (220 kW each)	339,978	59,976	30% was targeted, but said not to have been achieved. 15% is used.
4. Donetsk Region – 2 straw pellet boilers (220 kW each)	226,652	11,291	5% estimated. Project needed to send additional funds even for pipes.
5. Ivano-Frankivsk – 5 ha willow plantation and promotion thereof	48,029	8,476	Reported co-financing of $32,200 seems high given small area planted. 15% used.
6. Poltava – 5 ha willow plantation plus promotion	48,455	8,551	Reported co-financing of $28,400 seems high given small area planted. 15% used.
7. Zakarpattia – 5 ha willow plantation plus promotion	47,751	8,427	Reported co-financing of $31,590 seems high given small area planted. 15% used.
Subtotal first 3.5 years of Project	*1,504,147*	*236,692*	---
Last 1.5 years of Project – realized			
1. Nevytske Boiler (140 kw sunflower and straw pellet)	5,200	800	Small system, majority grant
2. Odessa #11 hospital boilers (4.5 MW sunflower husk pellets)	0	406,000	No *Ukraine Bioenergy Project* financing of investment; $5,000 plus expert support for TOR preparation provided for design.
3. Kupiansk suburb, Kharkiv Oblast technical design for straw bales CHP	0	240,000	*Ukraine Bioenergy Project* supported feasibility study preceding design work
4. UkrGas Bank Loan to Uman for bioenergy projects	0	1,000,000	*Ukraine Bioenergy Project* supported work that made municipal loan possible
Subtotal last 1.5 yrs realized	*5,200*	*1,646,800*	---
Total realized during project	**1,509,347**	**1,883,492**	---
Additional financing expected to be directly mobilized after project (conservative, no CHP project)	215,600 *(during project, but goes with after project amount to the right)*	3,833,664†	---
Total direct before and after project (conservative)	**1,724,947**	**5,717,156**	---
Additional financing expected to be directly mobilized after project due to 35% probability for CHP project (optimistic)	0	12,250,702‡	---
Total direct before and after project with 35% probability of CHP project (optimistic)	***1,724,947***	***17,967,858***	---

*Includes financing of investment projects, but not of TA for feasibility studies or design.

†As noted in the text, this figure is based on assigning each of the 48 pipeline projects an assessed probability of being implemented in the next few years, multiplying the probability by the investment required for each pipeline project, respectively, and summing the results across the 48 projects. Excluding the one very large CHP project, the result across the remaining 47 projects suggests probable investment to be realized of USD 4,461,264. The grants provided by the *Ukraine Bioenergy Project* to these pipeline projects total USD 220,800. Subtracting this amount from the probable total investment gives probable investment mobilized in these pipeline projects of USD4,240,464.

After subtracting already realized co-financing in these projects of USD 406,000 (Odessa) and USD 800 (Nevytske), the projected mobilized co-financing (conservative) post-project from the pipeline projects is USD 3,833,664, as indicated in the table.
‡This additional amount of USD 12,250,702 is the weighted probable investment in the large CHP project. Total investment in that project is indicated to be USD 35 M with 35% probability of being implemented. (Please note that the municipality has invested substantial funds of its own (USD 240,000) in technical design following *Ukraine Bioenergy Project* support of its feasibility study.) While there is a significant chance this project will be implemented, to be conservative, the main estimate of total financing directly influenced by project (either during or after project) is taken as USD 5,717,156 without inclusion of this CHP project.

project. The TE team suggests using this more conservative amount in estimating potential realizable total investment financing of the pipeline projects of the last 1.5 years of the project. As grants from the project for this pipeline total just USD 220,800, the projected "co-financing" for the pipeline in the conservative case is just under USD 4,240,464. Yet, much of this will be realized after the project. Co-financing to date on the pipeline projects is just that for the two projects that have been installed and are operational. This amount, at about USD 401,400, is a little less than one-tenth of what is expected to eventually be mobilized in the conservative case.

While the above analysis focuses on investments stimulated directly by the project, amounts included in co-financing for UNDP-GEF projects in practice covers a much broader range of expenditures, both cash and in-kind. Exhibit 26 shows committed co-financing (as detailed in the CER) by organization as compared to realized co-financing from those organizations/ sectors. In the column on the right, the findings and/or rationale for the realized co-financing amounts indicated are explained. Since these organizations may be grouped into different categories and actual co-financing may come from a different organization in the category than initially expected, the table also shows sub-totals for such categories, and has added in co-financiers that did not originally commit co-financing at the time of project design. The TE team understands that the project during its design phase envisioned a competition among cities to select those that would receive support under the project. Yet, it seems this competition may have not been carried out as planned. Had it been, the focus of co-financing might have been on commitments from the municipalities winning the competition.

At the national-level, in terms of specific government entities, most of the targeted in-kind co-financing of USD 3.27 million did not materialize, as MAPF, targeted to contribute USD 3 million, was not really involved in the project. Yet, because the national government instituted a new policy for biomass heating tariffs that increased the amount national and local governments pay for biomass-based heating, there was significant national-level co-financing. Estimates are that this new biomass tariff increased heating expenditures from national and municipal budgets combined by USD 1 million per year for the years of 2017, 2018, and 2019, for a total of USD 3 million. As information on the breakdown between national spending and municipal spending on these increased tariffs is not available, we roughly divide the USD 3 million (considered as co-financing in the broader definition of co-financing) between the national and municipal level.

As for UNDP co-financing, the targeted amount was USD 900,000, including USD 200,000 in cash and USD 700,000 in-kind. Detailed breakdowns were not available. An estimate was provided that USD 700,000 in-kind was spent, though, given the lack of detailed accounting, the TE team has reduced this estimate to USD 150,000. Evidence does suggest that UNDP expended substantial additional resources beyond those typically required on a GEF project of this size. Starting in 2017, there was a lot of additional work for UNDP personnel, including country office leadership and staff, the RTA, and even UNDP-GEF headquarters given the problems of this project (e.g. assessment and cancellation of large awareness contract, etc.) and also the need to revamp the project's strategy. In addition, UNDP provided additional support such as office space, conference room, presentations at conferences, and travel to municipalities to liaise with local leaders and sign MOUs.

Exhibit 26. Committed versus Realized Co-Financing

Organization	Type	Committed (USD)	Realized (USD)	Comments
Ministry of Agrarian Policy and Food	In-kind	3,000,000	0	Not involved in project
Ministry of Ecology and Natural Resources	In-kind	270,000	10,000	Very rough estimate of support for biomass working group meetings (facilities and staff time) as well as staff time for involvement in other project activities and meetings
SAEE	In-kind	0	40,000	Very rough estimate of support (facilities and staff time) for: (i) RE working group meetings on sub-topic of biomass; (ii) development of policy to increase biomass heating tariff; (iii) support to project for promotion of pipeline project work to municipalities and review of pipeline project work; (iv) involvement in various project events; (v) deployment of State Regional Development Fund to biomass boiler projects
State Regional Development Fund	Cash	0	100,000	Portion of boiler upgrades supported by Fund that are biomass boilers
State Budget (*General*)	Cash	0	1,500,000	Estimated portion of increased biomass heating tariff (due to new regulation allowing "90% of the tariff of natural gas" instead of previous "cost + 6%") borne by national level (2017-2019)
Subtotal: National Government	--	*3,270,000*	*1,650,000*	-----
UNDP	Cash	200,000	0	Management costs covered by US 470,000 agency fee
UNDP	In-kind	700,000	150,000	Very rough estimate with roughly 50/50 split between: (1) extra staff time and resources to support special problems with project and change of strategy; (2) extra resources, such as office space and meeting space for project, and time of leadership and other staff to promote project at conferences and travel to meet local officials and sign MOUs
Subtotal: UNDP	--	*900,000*	*150,000*	---
PE "Stepan Melnychuk" (Ivano-Frankivsk Oblast)	Invest-ment	1,875,000	0	No evidence obtained
"Agrarian Union" Ltd. (Ivano-Frankivsk Oblast)	Invest-ment	1,875,000	0	No evidence obtained
PrJSC "Kreativ" (Kirovograd Oblast)	Invest-ment	5,000,000	0	No evidence obtained
Other – Energy Plantations (local governments)	Cash and in-kind	0	25,454	Very rough estimate
Subtotal: Energy Plantations	--	*8,750,000*	*25,454*	---
"Aver-TECH" Ltd. (Cherkasy Oblast)	Invest-ment	12,000,000	0	None verified. Price paid by UNDP for boilers seems much higher than market price, so co-financing seems unlikely.
Subtotal: Suppliers	---	*12,000,000*	*0*	--
Ivano-Frankivsk Oblast State Administration	In-kind	5,000,000	0	None verified. I-F did approve an oblast-level plan prepared by project (1 of 8), so minimal in-kind contributions may have been involved and are

				included in aggregate oblast-municipal in-kind line item below
Uman City Administration	In-kind	37,500	59,976 *(may include both cash and in-kind)*	Realized amount is estimated co-financing for 3 Avers boilers. Not clear on breakdown of cash versus in-kind.
Uman Rayon State Administration	In-kind	80,000	0	None verified. Uman did approve oblast-level plan prepared by project (1 of 8), so minimal in-kind contributions may have been involved and are included in aggregate oblast-municipal in-kind line item below.
Other municipal co-financing: for Avers boiler projects (first 3.5 years and including Kiev Nature Center)	Cash and in-kind	0	151,262	Based on very rough estimates
Other municipal co-financing: for pipeline projects (last 1.5 years)	Cash	0	240,800	240,000 for design for major CHP project for which *Ukraine Bioenergy* supported feasibility study. US 800 from another city for a very small boiler project.
Municipal bioenergy loan financing stimulated by project FSM work	Cash	0	1,000,000	Verified bioenergy loan to Uman by UkrGasBank
Municipal Budgets (across many municipalities)	Cash	0	1,500,000	Estimated portion of increased biomass heating tariff (due to new regulation allowing "90% of the tariff of natural gas" instead of previous "cost + 6%") borne by municipal level (2017-2019)
Oblast and Municipal Government Time and Facilities	In-Kind	0	100,000	Very rough estimate of in-kind contributions of time and facilities for oblast-level plans, attendance at conferences and study tour, and liaison/ support for 48 pipeline projects
S*ubtotal Municipal and Oblast (and including Kiev Nature Center, but not including energy plantation contributions)*	---	*5,117,500*	*3,052,038*	--
Odessa private sector company	Cash	0	406,000	Investment in biomass boiler project for which *Ukraine Bioenergy* provided design funds
Subtotal private sector investment in municipal biomass boilers	--	*0*	*406,000*	
Total	--	**30,037,500**	**5,283,492**	--
Rough sub-total cash/investment versus targeted: USD 4,865,146 achieved versus USD 20,950,000 targeted Rough sub-total in-kind contributions versus targeted: USD 418,346 achieved versus USD 9,087,500 targeted *Note: Where breakdown for in-kind versus cash is unknown (namely straw pellet boilers and willow plantations), a 50-50 breakdown is assumed*				

USD 12 million in cash/ investment co-financing, which is about 40% of total committed co-financing and 57% of committed cash co-financing, was to come from the supplier Avers. Avers, as noted, eventually landed the largest contract of the project, for USD 1.54 million. As the cost of the boilers to the project are assessed to be substantially above market price, it is very likely that Avers did not provide co-financing to the project boiler installations. It might be argued that the USD 12 million was investment in Avers' own internal R&D, which apparently has continued since the time of the boiler installations. This

R&D to date, however, has not been shown to have had any benefit for or cooperation with the project and is thus not included in the TE team's estimates of realized co-financing.

At the local level, relatively large cash co-financing of USD 8.75 million was expected to come (in aggregate) from three organizations: (i) PE "Stepan Melnychuk" (Ivano-Frankivsk Oblast), (ii) "Agrarian Union" Ltd. (Ivano-Frankivsk Oblast), and (iii) PrJSC "Kreativ" (Kirovograd Oblast). The TE team guesses this co-financing may have been targeted for energy plantations. There is no information suggesting any of this cash co-financing was realized, though the TE team estimates a much smaller amount of USD 25,454 in co-financing for energy plantations.

Municipal and oblast-level co-financing is estimated to be about USD 3.05 million as compared to USD 5.12 million targeted. The largest amounts of realized co-financing at this level are: (i) the USD 1.5 million estimated as municipalities' share of the increased payment for biomass heating tariff due to the new tariff policy as spent in 2017, 2018, and 2019 mentioned above and (ii) the USD 1 million loan to Uman for seven biomass boiler systems. As noted, the project is believed to have played a key role in stimulating these investments through its support of boiler projects in Uman (both early straw pellet grant projects and a later pipeline project) and its support of the restart of municipal loans in Ukraine and education of the banks on these and on bioenergy projects.

As noted earlier, the targeted co-financing ratio for this project with USD 4,700,000 in GEF financing and USD 30,057,500 in committed co-financing is 6.4 times. Since co-financing realized is instead USD 5,283,492, the leveraging is only 1.1 times. Considering that the project strategy was off-track and the new team had just 1.5 years to implement the project as designed, it is worthwhile to consider the expected financing that will be directly mobilized by the project in the three years following project close. Based on the results in Exhibit 27 and 28, the total of co-financing during the project and directly mobilized financing in the few years after the project (conservative estimate without the CHP project) is expected to total USD 9,117,156, suggesting a leveraging ratio of 1.9. Including the CHP project (weighting it with a 35% probability of being realized), the total of co-financing during project and investment directly mobilized after the project is USD 21,367,858, suggesting a leveraging ratio of 4.5. While it is hoped the CHP project comes through, use of the more conservative estimate suggests the project, even if direct post-project mobilized investment is included, has substantially underperformed its leveraging target.

12. Conclusions, Lessons, Recommendations

12.1 Conclusions

The TE's most important conclusions are summarized below. This is the same summary that is included under "Project Overall" in the Executive Summary. The content is covered with more detail and explanation in Section 2, also entitled "Project Overall."

<u>Relevance – Need and Innovativeness</u>

- Focus on municipal agri-bioenergy in Ukraine is highly relevant, as municipal heating is an under-addressed segment within bioenergy; and agricultural wastes are an under-addressed feedstock, wood being 90% of solid biomass capacity in Ukraine. The "straw/ stalks" biomass category has potential to rise from 0.08 toce in 2017 to 5.26 toce in 2035, which is 53% of the total 2035 bioenergy forecast.

Results and Impacts – Most Striking

- Most important project result is development over past 1.5 years of extensive municipal bioenergy project pipeline with 48 projects across 35 cities. Project supported 33 feasibility studies and 19 detailed technical designs. Support of designs is a new area that increases likelihood of implementation. Most impressive is that many of the pipeline projects are likely to be implemented, vast majority without funding from project. Considering implementation probability of each project (see Exhibit 11 on page 26), TE team estimates at least 25 projects (over half) will be implemented.
- Via its financial support mechanism work with IFC, the project enabled relaunch of municipal loans in Ukraine, which had halted since 2012 – a significant and meaningful feat. Work included developing a credit rating system for municipalities that could be used instead of collateral (which municipalities are unable to provide) to reduce the reserve ratio required to be held by banks for such loans. So far, only one bioenergy loan (≈US 1 M to Uman from UkrGasBank) and only 6 loans total have been made to small and medium sized cities (≈US 25 M in aggregate, all from UkrGasBank, compared to ≈US 217 M in aggregate to large cities), so further barrier removal work is needed. At the same time, it should be noted that extremely high and unstable interest rates in Ukraine have been a disincentive for municipalities to pursue the loans that are now available to them.[10]
- TE findings indicate project strongly contributed to change of mindset of municipalities, leading to substantial and serious bioenergy pipelines in certain cities, especially Zhytomyr, Odessa, and Uman.
    - Following project-supported feasibility study, Kiyvsharivka City (Kharkiv Oblast) spent USD 240,000 on design for 25 MW_{th}, 10 MW power CHP project requiring US 35 M investment.
- With a focus on schools with its installations and especially installation at the Nature Center in Kyiv, project has opportunity to impact the thinking of the next generation.
- Project's Bioenergy Working Group hosted by MENR likely was a major factor in MENR prioritizing biomass for € 7 M in BMU funding for its International Climate Initiative (IKI)[11] in Ukraine, the only such BMU funding targeted for a specific sector under IKI in Ukraine.

Challenges

- Project as implemented during first 3.5 years showed lack of focus on its targeted objective-level and outcome-level results. For example, there was no effort to develop a pipeline of bioenergy projects that did not depend almost entirely upon grant funding. Also, policy work during that period was overly broad, with 12 different individual consultants hired and lack of evidence of results.
- The project in its first 3.5 years did not recruit persons with strong expertise in bioenergy and instead appears to have attracted mainly generalists to apply for consultancies.
- During the first part of the project, GEF funds slated for investment were not used strategically. There was a USD 1.5 million contract with a supplier to provide a type of straw pellet biomass boiler that appears to have had low probability of replication due to costs. While 12 grant boilers have been installed, there are no municipal replications; and private sector replications have not been confirmed. GEF funds covered 100% of boiler and installation costs, with limited related support from municipalities (up to 15% of total costs), despite ProDoc stipulation of maximum 25% grant. Relatedly, most of the co-financing indicated in the ProDoc failed to materialize. Yet, due to a change in strategy the last 1.5 years, significant investment is expected to be mobilized after project close.
- The first part of the project showed a lack of cost effectiveness. The two prime examples are the USD 1.5 million boiler contract and a USD 753,000 awareness contract. The first may have been almost twice the price it should have been and the second, perhaps three times. For the latter, the number of trainings required (338) seems excessive. With a lower number of trainings, the reasonable contract size would have been even lower. The awareness contract was not in the approved budget and was

[10] Throughout 2014 to 2019, the interest rates have changed significantly, with a peak value at 30.0% in mid-2015, and a low of 12.5% in mid-2017.
[11] Request for proposals was issued in December 2018.

charged to the wrong component, but was eventually cancelled, a success of UNDP QA. Payment to vendor was around USD 235,000.

- The project faced major challenges due to the country situation, but, instead of using adaptive management to find new and innovative ways to address project aims, in the first 3.5 years, the aims seem to have been treated as untenable, resulting in an unsustainable focus on 100% grants for boilers. Adaptive management was indeed carried out the last 1.5 years with excellent results, but it was late. The project would have benefitted greatly if it had been carried out earlier.
- The project during its first 3.5 years focused on sub-optimal government partners. Even at project launch, SAEE would have been the proper government partner for achieving policies to promote biomass and for reaching out to municipalities to encourage them to implement bioenergy projects.
- Decision-making and oversight functions were flawed. The project's oversight body, the Project Board, seems ad hoc without a clear decision-making process or clear guidelines for membership. Further, the project in its early phase did not respect the oversight role of UNDP-GEF, namely the RTA role in approving major changes to the budget. The US 753,000 awareness contract was signed without the required RTA approval of budget revisions.

12. 2 Lessons and Recommendations

Recommendations and the *Ukraine Municipal Bioenergy Project* lessons learned from which they stem are discussed below. These are divided into two sub-sections, one on results and project design and one on implementation and oversight.

A. Related to Results and Project Design

1. In future projects, stimulate investment in desirable technologies and infrastructure by adopting the *Ukraine Municipal Bioenergy Project's* approach of generating a large project pipeline, notably including support of technical design; consider adding to "the formula" follow up support to get pipeline projects funded. Begin such pipeline work at the start of the UNDP project rather than the end: Many projects aim to stimulate uptake of desirable technologies and practices and achieve investments on a wide scale. The *Ukraine Municipal Bioenergy Project's* pipeline project work of the last 1.5 years, with 48 projects across 35 cities, is getting exciting results in terms of likelihood that pipeline projects will be financed and implemented. It is recommended future projects aiming for wide uptake of technologies adopt the same model, key elements of which are: (1) a roster of expert consultants that assist clients, such as municipalities, in feasibility studies and TORs for technical design; (2) funding for feasibility studies for a large number of clients; (3) funding for technical design for a large number of clients; (4) strong interactions between the clients and roster experts that emphasize financial viability of projects and getting projects financed. In particular, there should be an aim to start supporting feasibility studies and technical designs much earlier in the project lifetime and to support as many technical designs as possible, as getting the TDs done provides the greatest assurance that pipeline projects will be implemented. While some indicated to the TE team that donor projects cannot support technical design for municipal projects in Ukraine, the *Ukraine Municipal Bioenergy Project* found a way to do this, an innovation that could be adopted by other projects. This approach contrasts with the project's early phase work, which provided 100% of required funds for high-cost boilers and installation and did not result in any replication. Further, to this new "pipeline" model might be added follow up to ensure projects get funded. For example, IFIs often make use of feasibility studies prepared under UNDP and GIZ projects for the projects they fund, so that outreach to them regarding larger projects (e.g. requiring investment of € 5 million or more) could be conducted. Also, now that banks will make loans to municipalities, facilitation of the loan process may be a promising area for the project team to support.

Who: Designers and implementers of UNDP projects in Ukraine that aim to promote adoption of certain technologies or practices in investment projects. (UNDP CO portfolio managers, project managers, RTA, project design consultants)
What: Adopting of approach of stimulating large pipeline of projects by supporting clients with team of expert consultants and support for technical design (and feasibility study prior to that if needed).
When: Jan. – March 2020, look for opportunities in current projects and in those under design. Ongoing for projects designed later.

2. Take ownership of success in re-launch of municipal loans in Ukraine and follow up to stimulate uptake of loans by small and medium cities, which is an underserved space for loan finance: The re-launching of municipal loans in Ukraine, which had stopped completely since 2012, is a success of the *Ukraine Municipal Bioenergy Project*, namely its work on the financial support mechanism with IFC (originally intended to also develop specific bioenergy and energy efficiency loan products). Yet, there is a lack of awareness of this success. While the launching of the bioenergy and energy efficiency loan products were not really achieved, the relaunching of municipal loans in Ukraine is very important; and the one bioenergy loan that has been achieved shows that there is potential for more such loans. UNDP CO should take ownership of the success and publicize it. At the same time, gaps in the work should be recognized and addressed. UNDP CO should look for opportunities to follow up on this work, which has yet to generate a large number of loans among small and medium sized municipalities and has only generated one bioenergy loan. While high interest rates are a key barrier, follow-up with cities could stimulate more uptake. Cities need to be educated on "doing the math," which will show some high-return projects to be attractive even with high loan interest rates. Smaller cities may also need support in getting their accounting in order for loans. While the IFIs provide loans to large projects (e.g. € 5 M and over for EBRD) and some now have small loan programs that might be suitable to households, loans and financing generally for small and medium cities is an underserved space appropriate to UNDP's comparative advantages.
Who: UNDP communications team (to promote the success); UNDP portfolio managers (to look for opportunities in ongoing or under design projects to follow up with cities; to consider follow up with donors for funding a specific, small capacity building initiative)
What: Promotion of success in re-launching municipal loans; capacity building for small and medium cities to understand value of loans even at high interest rates and to get their accounting in order; possible design of new, small project in this area
When: Jan. – June, 2020 for promotion and Jan. – March, 2020 for review of opportunities in portfolio and decision of whether to pursue additional funding for a capacity building initiative.

3. Learn from *Ukraine Municipal Bioenergy Project's* challenges in setting up a biomass support unit: (i) For similar work in future projects, consider option of setting up sustainable non-government institution to support development of targeted type of investment projects. For a long-term bioenergy-specialized platform to support development of bioenergy investment projects, consider cooperation with Ukraine Bioenergy Association. (ii) For a general platform to support investment projects across multiple priority areas (i.e. not only bioenergy), consider setting up long-term platform in Ukraine, perhaps within UNDP CO.: (i) The *Ukraine Municipal Bioenergy Project* aimed to set up a Biomass Support Unit (BSU) within government, but this was not viable. Future projects with a similar aim of supporting investments in a specific priority area may consider setting up non-government organizations, either as independent entities or as a part of existing entities. It will be important during the lifetime of the project to determine a way the entity can generate funds to be sustainable. If time and funding permits, efforts may be made by the current project or successor projects to set up a long-term bioenergy investment project support platform within the Ukraine Bioenergy Association, possibly in cooperation with SAEE. (ii) As for the idea of a more general platform to support investment projects across multiple priority areas, UNDP CO may also consider the idea of a long-term project development support platform, perhaps within UNDP CO. The platform would include a few team

members that provide support to proposed investment projects in priority areas (such as bioenergy), helping them develop their plan and secure financing, such as through bank loans or other means. The rationale for such a platform is that many UNDP projects are trying to do similar things, such as setting up financing mechanisms, but the limited project durations make it challenging to set up the mechanism and use it extensively. If there were an ongoing platform, this could support clients in UNDP areas of comparative advantage, such as small and medium-sized cities. It may be supported partially over time by various projects under implementation and partially by minimal fees charged to those making use of services.
Who: UNDP CO leadership, portfolio managers, QA team, RTA
What: (i) For existing projects that wish to set up project-specific, sustainable support units, consider non-government options. (ii) Discuss and develop the idea of a long-term platform to provide support to potential investment projects in UNDP priority areas.
When: Jan. – March 2020 for idea of setting up specific support units related to existing projects and projects under design; ongoing for projects designed in the future. Jan. – June 2020 for idea of long-term platform.

4. Consider including in future donor biomass projects implemented by UNDP, especially near-term opportunities: (a) work to develop the agri-biomass supply chain (a gap in current project); (b) transition of rural household wood use to agri-biomass; (c) sourcing work to reduce costs and increase lifetime of agri-biomass boilers; (d) policy work to promote agri-biomass, in particular, and biomass generally. (a) Work on realizing a robust Ukrainian agri-biomass supply chain, lack of which may have been a shortcoming of the *Ukraine Municipal Bioenergy Project*, could include: (i) work on a biomass exchange (including regulations to support the bioenergy exchange law, establishment of exchange via organizing of bidding for exchange operator and via organizing of trading, and promotion of exchange among producers and buyers); (ii) setting up and implementing standards for biomass quality; (iii) setting up certification for biomass quality; and (iv) support to municipalities in finding sources of biomass fuel. (b) For wood-using rural households, agri-biomass could be promoted (such as briquettes) to be used in current stoves or newly promoted more efficient ones. (c) Boiler sourcing work could look to determine the best cost sources of agri-biomass boilers that also ensure long lifetime of boilers. This may include information on suppliers of equipment, both national and international, for municipalities. It may also include research on technologies used internationally, such as China's use of straw with a range of technologies, etc. (d1) Policy work to support agri-biomass in particular may include: (i) adjustment of green tariff policy to favor agri-biomass over wood and (ii) preferential policies or subsidies for agri-biomass briquette/pellet makers, agri-biomass boiler producers, and companies storing agri-biomass. (d2) General legislation may include: (i) regulations to support bioenergy crops legislation, (ii) support for Ukraine integration with EU biomass policies, and (iii) policy support to open up heating market to third parties, which would in turn stimulate investment in municipal bioenergy heating.
Who: UNDP CO International Advisor and Portfolio Manager working with partners
What: Integrate recommendations for future activities into proposals for new bioenergy projects
When: Jan. – June 2020.

5. National policy and oblast-level planning work in future projects should become more results oriented: (a) National-level policy work should have increased focus, (i) targeting adoption of a few top priority policies (rather than long, unprioritized lists of such targets) and (ii) ensuring these are squarely within the targeted results area of the project. (b) If possible, policy work should be carried out with support of policy experts with strong experience in the relevant sector. (c) Oblast-level planning work should include follow-up support to oblasts to ensure adopted plans are implemented: (a-i) The *Ukraine Municipal Bioenergy Project* had numerous policy consultants and prepared a long list of draft policies and related items. Yet, a more concerted effort focused on the drafting and adoption of a few top priority policies is a more strategic approach that should be adopted in future projects. Further, priority policies to work on will ideally be identified during the project

preparation phase, rather than requiring exhaustive and costly "policy studies" to be carried out during full project implementation. (a-ii) Further, the policy work should not become too much broader than the targeted results area of the project. For example, if the project focuses on bioenergy, it would be better for the project to focus on bioenergy policies or specific aspects of heating policies particularly important to the development of bioenergy, rather than policies addressing all of renewable energy. (b) Further, if there are experts on policy in the sector, these should be strongly considered as consultants to do the work rather than generalists. (c) With regard to oblast-level plans, the *Ukraine Municipal Bioenergy Project* got eight of these adopted, but lack of follow up to support the oblasts in implementation may mean these plans sit on a shelf. Ideally, support after plan adoption might link the plans with actual pipeline work of the sort described in Recommendation 1.
Who: Designers and implementers of UNDP Ukraine projects that have policy and planning components (UNDP CO portfolio managers, project managers, RTA, project design consultants)
What: Adjustment of policy approach from "extensive" to "intensive" so there is a focus on developing and getting adopted a few priority policies. Recruiting the most qualified policy consultants in the sector, if possible. Ensuring follow up on oblast-level plans developed, perhaps by linking them to support for development of pipeline projects.
When: Jan. – March 2020, look for opportunities in current projects and in those under design. Ongoing for project designs of the future.

6. Ensure work in future projects is action oriented. Limit studies and reports in future projects to those that will truly be used and ensure that other project activities leverage these documents to support targeted results. Consider requiring preparers of reports/ studies to carry out action-oriented follow up related to their work, perhaps with success criteria as a condition for final payment: In the *Ukraine Municipal Bioenergy Project*, as in so many projects, there are a number of reports that were prepared but do not appear to be used. Future project design and adaptive management of projects under implementation should adopt a strict policy of limiting assignments focused on report, study, and document preparation. All such assignments should have a clear potential for practical use of the document products; and the relevant project should have activities to ensure the documents will be leveraged toward project results, whether these are installations, new policies, etc. Further, those recruited to prepare reports or studies could be required to be the ones to carry out action-oriented follow up. That is, a preparer of a plan should work not only to draft it, but also to assure it is adopted and then to see that it is implemented. For example, a preparer of a report on product quality (such as biomass pellet quality) should see to it that the report is used in developing a quality assurance system for the market. Final payment for such consultants may be contingent on carrying out this "action-oriented" work. It might even be possible to include success milestones for certain payments.
Who: Designers and implementers of UNDP projects in Ukraine (UNDP CO portfolio managers, project managers, RTA, project design consultants)
What: Review designs/ project plans to eliminate reports/ studies that won't be used. Adjust activities to ensure that remaining reports are leveraged towards end results, such as installations, policies, etc.
When: Jan. – March 2020, look for opportunities in current projects and in those under design. For future projects, ongoing.

7. To enhance the sustainability of *Ukraine Municipal Bioenergy Project's* 48 pipeline projects and the potential for replication of them, prepare a brief compendium of case studies, with 1 or 2 pages per project, and combine with a final lessons learned summary for the project. Follow up in 1 and then 2 years to determine number of projects implemented and the investment mobilized: The current project's pipeline of bioenergy projects is quite impressive and has the potential for wide impact. To ensure and expand upon that impact, a one or two page case study of each project should be prepared, emphasizing financial viability. The case studies may serve a dual purpose: (a) attracting financing and (b) stimulating similar projects in other municipalities. The compendium of case studies may be shared with financiers, especially UkrGasBank and Oschad Bank, to encourage the possibility of loan financing.

It should also be shared with as many municipalities and federations of villages as possible, once a strong contact point in each municipality and federation is identified.
Who: Bioenergy Roster Team Leader and Bioenergy Roster Consultants, International CTA, Project Associate, UNDP Communications Team, UNDP CO M&E Team, UNDP Portfolio Manager
What: Roster Team Leader prepares template and International CTA, in consultation with Roster Team Leader, prepares lessons learned study; Roster Consultants prepare one to two page summary of each of their projects according to the template. UNDP Communications Team and/or Project Team collates and formats document and determines how best to get it shared with municipalities and financing sources in Ukraine. 1 and 2-year follow-up work coordinated by UNDP CO M&E Team and UNDP Portfolio Manager
When: Dec. 2019 for first case study and lessons learned preparation. Jan. 2021 for 1-year follow-up. Jan 2022 for 2-year follow-up.

8. For future projects that have demonstrations and target replication of them: Ensure financial viability is a priority for all demonstrations. Consider also including work in sourcing to find the lowest cost option with good quality and communicating the results to those that may develop projects: A lesson learned from the *Ukraine Municipal Bioenergy Project* is that high cost demos may not be replicated. The Avers straw pellet boilers that were procured with contract size of over USD 1.5 million were not replicated due to high cost. Future projects should make financial viability a cornerstone of demonstrations so that replication can be achieved. TA for sourcing work could identify the best, most cost-effective sources of financially viable equipment options of good quality.
Who: Project designers and implementers: UNDP Portfolio Manager, UNDP Advisor, RTA, Project Managers, Project Design Consultants
What: Incorporate cost viability criteria into all demonstrations
When: Jan. – March 2020 for existing projects or projects under design; for future projects, ongoing

9. Use domestic study tours as an effective means of building awareness and developing investment project pipeline in future projects. Include municipal officials in such study tours when relevant to the project topic. If it can be arranged for 2020 (post-project), consider second domestic study tour for UMBP, possibly in conjunction with final workshop: The *Ukraine Municipal Bioenergy Project* has utilized a domestic study tour to create awareness and build a project pipeline. While many projects assume a study tour by definition needs to be international, domestic study tours may be not only a more cost effective means, but also a generally more effective means to achieve targeted results. A domestic study tour allows participants to see the technology or approach of interest in their own national environment, which may give them a more realistic example than something they would see abroad. In terms of the *Ukraine Municipal Bioenergy Project*, if it is possible to hold a domestic study tour in 2020, after project close, such a final domestic study tour could be carried out in conjunction with a final project workshop to showcase the project results. Given that many of the project's pipeline biomass projects are still not finalized/constructed, it is recommended if possible to hold this final project workshop/study tour in 2020 when there will be more to see and more results to present. The study tour could take place at the same time as the final project workshop, showcasing to municipal officials the results of the work of the project. At the same time, it is recognized that rules may require all project activities to be completed by the project close date. If this is true, UNDP might explore whether follow-on UNDP-implemented projects, such as a potential pipeline bioenergy project could combine such a tour and workshop with preparatory work.
Who: Project designers and implementers: UNDP Portfolio Manager, UNDP Advisor, Project Managers, RTA, Project Design Consultants; and current (*Ukraine Bioenergy Project*) project team / UNDP team for project: CTA, Project Associate, UNDP Portfolio Manager, RTA
What: Consider whether domestic study tours could be a strategic activity for other/ future projects; determine whether *Ukraine Bioenergy Project* has time for second study tour; and, if so, make plans for it in coordination with final workshop.

When: Jan. – March 2020 for existing projects or projects under design; for future projects, ongoing. Immediately for planning (Dec. 2019) and sometime in 2020 for implementation for *Ukraine Bioenergy Project*.

10. In design phase of future projects, be careful not to lock in suppliers and other partners without competition, unless there is strong rationale for doing otherwise. Even in the case of municipalities, competition or at least consideration of multiple possible partners may be the best approach: Competition will ensure better value for equipment and that the involved cities are the most proactive, have the best proposed projects, and provide substantial co-financing.
Who: Project designers: UNDP Portfolio Manager, RTA, UNDP Advisor, Project Design Consultants
What: Ensure multiple equipment providers, if any, are involved in design phase. For projects with partner municipalities, ensure multiple municipalities are considered. A competition may be used to select municipalities. Otherwise a ranking systems should be developed to make the decision.
When: Ongoing, as projects are designed.

B. Related to Implementation and Oversight

11. For directly implemented projects, develop clear guidelines on Project Board (PB) membership and PB role, including how decisions will be made. In the *Ukraine Municipal Bioenergy Project*, PB decisions were used to justify changes, such as the large allocation from the investment component for awareness/ training. Yet, membership of the PB; and the PB's decision making process seemed ad hoc, without clearly defined guidelines.
Who: CO leadership with RTA guidance and support, with input of Portfolio Manager, Advisor, and QA Analyst
What: Guidelines for membership of project boards of various projects; guidelines for project board decision making; scope of authority of project board decisions
When: Jan. - March, 2020

12. For future projects, take greater care in identifying/ selecting government project partners to ensure partner is the optimal one for the project at hand: The *Ukraine Municipal Bioenergy Project* in its first phase partnered with a member of the Parliament's Environment Committee and with Ministry of Agriculture. When the latter was not responsive, ministerial focus was shifted to MENR. For the last 1.5 years, Parliament's Energy Committee and SAEE became partners instead. These seem the more effective partners for bioenergy policy and also, in the case of SAEE, which is under Ministry of Regional Development, implementation in the municipalities. In the case of *Ukraine Municipal Bioenergy Project*, it would have been best to partner with Ministry of Regional Development and SAEE from the beginning. In general, as there are overlapping areas of interest among government entities, selection of government partners should include careful analysis that considers the specific aims of the project, such as policy adoption, projects on the ground in municipalities, etc. As the direct implementation modality (DIM) is currently being used by UNDP Ukraine for its GEF-financed projects, partner selection is a less formal process than determining IP for nationally implemented projects and thus UNDP has greater leeway in partner selection.
Who: project designers: Portfolio Manager, advisor, RTA, project design consultant; and implementers of current projects: project managers
What: For each relevant project, carry out assessment of top pick partners to determine, in close consultation with Government of Ukraine, the most appropriate one in terms of achieving intended project results. For directly implemented projects, if partners are not optimal, considering making moves to engage the more optimal entities in project activities.
When: Jan. - March, 2020 for existing projects. Ongoing for future projects.

13. Improve procurement: (i) In recruiting personnel and contractors in future projects, work harder to include those that have relevant expertise to ensure the best candidates for project staff members and consultant positions get involved with projects. (ii) In future projects, incorporate more measures for cost control and getting the best price in procurement, with a key step being to first determine the "real, reasonable" price. (iii) For major procurements, evaluation panel members should include technically qualified subject matter experts and/or persons that understand the aims of the respective project well, including participants from regional offices or headquarters for all large procurements. Ensure existing procedures/ systems for large procurements are followed.

(i) The current project seemed to fail in its first phase to directly involve the best candidates in the most critical aspects of work. Experts in bioenergy available on the market were not involved in key activities, while instead generalists carried out or at least led almost all project activities. Steps to get the best candidates involved may include: (1) Identify desired bidders for important contracts and reach out to encourage participation in bidding process. (2) Enhance measures to ensure that TORs are designed so that the best candidates with the best quality-price combination win. TORs should be screened to ensure they do not include unnecessary qualifications that might eliminate quality and cost effective bidders in favor of less qualified and more expensive ones. Projects should also avoid direct procurement (no competition) of contractors unless their unique qualifications are extremely well justified. An international CTA that is proactive in ensuring quality candidates for key procurements and in checking the work of experts can be an effective means to improve selection and monitoring of consultants and consultancies. The *Ukraine Municipal Bioenergy Project* had no CTA until around Dec. 2016, almost 2.5 years into the project. While there is no evidence the first CTA played a role in recruiting and monitoring experts, the second CTA, with launch of the project pipeline work, played a very positive role in the liaison with and guidance of the bioenergy roster experts.

(ii) The *Ukraine Municipal Bioenergy Project* may have overpaid for some of its procurements. UNDP may consider strengthening internal processes for researching market prices and taking other actions to ensure that procurements are not overpriced. That is, after a first step of determining the "real, reasonable" price via market research, if all bids are substantially over that price, further work should be done to determine why and to see whether more cost-effective, quality bidders can be encouraged to participate in a second call for proposals. Negotiations with first round bidders based on knowledge of the "real, reasonable" price may also be conducted.

(iii) Greater expertise on procurement panels can address some of the issues in (i) and (ii). This may be a matter of instituting new requirements for who will serve on those panels, but, as a first step, it should be ensured that existing rules for large procurements are followed. UNDP staff from headquarters (New York) and/or regional headquarters (Istanbul) should be included on the panels for such large procurements. Any inclusion of non-UNDP staff should be justified. For the large awareness contract of the *Ukraine Municipal Bioenergy* Project, an individual who had been a consultant on a previous project was included as UNDP staff, though her assignment on the previous project was over. And, the panel appeared to lack regional or headquarters involvement as required of large procurements.

Who: Project managers, advisors, and portfolio managers; procurement personnel; project team; QA personnel; CO leadership

What: (i) Identification of desired bidders, outreach to the same, review and improvement of TORs to delete unnecessary qualification requirements. (ii) For each procurement, as relevant, carry out research on the "real, reasonable price" and incorporate into procurement process. Carry out second calls for proposals and/or negotiations when all bids are substantially above the "real, reasonable" price. (iii) For each large procurement, ensure the team has technically qualified personnel and/or personnel that understand aims of project/ project details clearly, involving regional and headquarters persons.

When: Ongoing

14. Improve understanding of UNDP CO leadership regarding the GEF approach and priorities, such as GHG emission reductions and replication of demonstrations, and typical problem areas to watch for in UNDP-GEF projects, via two-page checklist. Ensure systems facilitate means of getting quick feedback to CO from UNDP-GEF, such as regarding major procurements: Some challenges with the *Ukraine Municipal Bioenergy Project* may have been due to a lack of understanding in the CO of GEF priorities and guidelines/ rules for management of UNDP-GEF projects. Important concepts that CO leadership should understand are: (a) the most important targets of UNDP-GEF projects (such as amount of GHG emission reductions for climate change mitigation projects or the amount of land area under sustainable forest management for projects in the sustainable forest management area) and (b) how these are typically achieved (e.g. demonstration and replication of financially viable demos). They should also understand (c) the guidelines under which UNDP-GEF projects operate, such as that major budget changes require approval of the RTA and that budget movements of over 10% of GEF funds between components require GEF approval (and thus are generally avoided, unless very critical to success of the project). Ideally, a one or two-page high-level checklist covering the important concepts and guidelines associated with UNDP-GEF projects should be prepared and provided to CO leadership so that they can understand some of the fundamental ways such projects can go wrong and what the projects ideally should be trying to do. In addition, a way for the CO to get quick feedback from UNDP-GEF, such as for major proposed procurements, needs to be systematized so the country office is not left hanging without guidance.
Who: UNDP-GEF HQ and Regional Teams (RTAs), UNDP CO leadership
What: Preparation of 2-page briefing for UNDP CO leadership in each relevant area (e.g. climate change, biodiversity, etc.) by UNDP-GEF; review of briefing by CO leadership
When: Jan. – June, 2020

15. Step up gender strategy of Ukraine UNDP CO and its projects by looking to promote talented and high integrity women to leadership positions, including project manager roles and roles as leading consultants on projects. The *Ukraine Municipal Bioenergy Project* had some women in leadership positions as consultants, but, overall, women were substantially underrepresented. Only two of 17 participants on the overseas study tour to Sweden in 2015 were women. At the same time as UNDP projects face such underrepresentation of women, UNDP also faces challenges in finding qualified and high integrity persons as project managers and other leaders in its projects. Thus, tapping the pool of qualified women may be a way to address both issues at the same time. As each UNDP CO has a staff member who is focal point for gender, that person in the Ukraine CO could take the lead in working with HR and CO leadership to address this recommendation.
Who: UNDP CO leadership, UNDP CO focal point for gender, UNDP CO portfolio managers and QA analysts, UNDP CO Human Resources Department and Procurement Department
What: Develop initiative to promote talented and high integrity women to leadership positions as project managers and to recruit more women to leading consultant positions on projects
When: Discussions on plan for initiative: Jan. – March 2020; then implementation: ongoing

Annex 1. Evaluation Mission and Other Consultations – Realized Schedule

Consultation Segments
Pre-Mission via Skype: September 6, 2019
Mission: September 8 – 20, 2019
Post-Mission via Skype: October 9 – November 14, 2019
Post-Mission follow-ups with previously consulted stakeholders via email: September 25 – November 19, 2019. Several stakeholders were contacted with follow-up questions during this period and provided helpful feedback. These "email consultations" are not included in the below listings, though one interview that could not be conducted by Skype and instead was conducted by email is listed.

Consultations

1. Pre-Mission (all via Skype)

Date	Name, Role, and Organization
Sept. 6, 2019	Mr. John O'Brien, Regional Technical Advisor (RTA) on Climate Change Mitigation, Istanbul Regional Hub, UNDP Regional Bureau for Europe & CIS

2. Mission in Ukraine: Sept. 8-20, 2019

Sept. 8 (Sunday) Kiev
1-1. Second and current CTA to the Project (first meeting): Mr. Paata Janelidze, also Advisor to Energy and Environment Portfolio of UNDP Ukraine
Sept. 9 (Monday) Kiev
1-2. UNDP CO and Bioenergy Project team: Mr. Andriy Zayika, Portfolio Manager, UNDP CO; Ms. Polina Nezdiikovska, Manager of M&E for Energy and Environment Portfolio, M&E Team, UNDP CO; Mr. Paata Janelidze, Advisor to UNDP CO on Energy Environment Portfolio and CTA to Bioenergy Project; Ms. Inna Pokydko, Project Associate, Bioenergy Project 1-3. State Agency for Energy Efficiency and Energy Saving of Ukraine, Ministry of Regional Development: Mr. Sergiy Savchuk, Head; Mr. Valerii Kotsiuba, Director of Department of Investment Activity in Renewable Energy; Director of International Cooperation; and one other 1-4. Bioenergy Association of Ukraine: Mr. Yuri Matveev, Board Member, and Ms. Tetiana Zhelienzna, Member of the Council of Experts 1-5. Senior Biomass Expert to Project Leading Investment Promotion in Municipal Use of Biomass (2018-2019) (first meeting): Mr. Georgii Geletukha, Director of Scientific Engineering Center for "Biomass"
Sept. 10 (Tuesday) Kiev
2-1. UkrGasBank EcoBank: Mr. Volodymyr Vysotskyi, Deputy Head, Ecological Projects Department 2-2. First UNDP Programme Analyst Responsible for Project: Mr. Sergei Volkov, now Deputy Head, Head of Programme, and Representative to Belarus and Moldova, UNOPS Europe and Central Asia 2-3. IFC: Ms. Zoia Goptsii, Financial Sector Specialist 2-4. Former People's Deputy and First Vice-Chairman of Parliament's Committee on Fuel and Energy Complex, Nuclear Policy and Nuclear Safety: Mr. Oleksandr Dombrovskyy
Sept. 11 (Wednesday) Uman and Palanka *(roundtrip transit by road from Kiev)*
3-1. Deputy Mayor of Uman: Mr. Serhii Kochko 3-2. Mayor of Uman: Mr. Oleksandr Tsebriy, with Head of Department of Housing and Communal Services of Uman City Council – Mr. Vitaliy Kharchenko

3-3. Department of Housing and Communal Services and Site Visit to Avers straw pellet demo boiler supported by project at a school: Mr. Vitaly Kharchenko 3-4. Palanka: Deputy Mayor of Palanka Federation – Mr. Myclashchuk Ihor; Mayor of Palanka Village – Ms. Panasiuk Halyna; Head of International Cooperation – Ms. Natalia Stanislavchuk; and Businessman – Chekalenko Vasyl (director of LLC "Berestovets")
Sept. 12 (Thursday) Zhytomyr *(roundtrip transit by road from Kiev)*
4-1. Zhytomyr City Government and Education Sector Stakeholders: Deputy Mayor – Ms. Oshansak Neten; Deputy Director of Construction – Mr. Alexander Dikhtiar; Deputy Head of Energy Efficiency – Mr. Alexander Honcharuk; Director of school with two project-donated straw boilers – Mr. Melnyk Mykola; Director of kindergarten with project-donated straw boiler: Ms. Hut Nataliia 4-2. Site Visits in Zhytomyr: (1) School with 2 straw pellet Avers demo boilers supported by project; (2) Kindergarten with 1 straw pellet Avers demo boiler supported by project 4-3. Project's lead technical consultant for supervision of design, quality, monitoring and technical assistance for EE/biomass projects: Ms. Svitlana Yarosh 4-4. Zhytomyr Municipal Enterprise: Mr. Dmytro Rogozhyn, Director, Zhytomyr Municipal Enterprise of Zhytomyr City Council, and Academician of Engineering Academy of Ukraine
Sept. 13 (Friday) Kiev
5-1. Second UNDP CO Programme Analyst responsible for Project: Ms. Alla Tynkevych, Programme Analyst, Energy and Environment, UNDP Ukraine 5-2. First Project Manager of Ukraine UNDP-GEF Bioenergy Project (2014-2018) *via Skype*: Mr. Volodymyr Lyashchenko, Programme Coordinator of Economic Recovery and Restoration of Critical Infrastructure Component of Recovery and Peacebuilding Programme, UNDP Ukraine 5-3. Expert to Project on financial feasibility of boilers using agricultural biomass as a fuel in municipal energy sector of Ukraine (2018-2019): Mr. Yevhen Oliinyk, Board Member of Bioenergy Association of Ukraine 5-4. Expert to the Project on feasibility study for agri-biomass briquette and pellet production, Mr. Semeon Drahniev 5-5. National Ecology and Nature Youth Center in Kiev, where 3 demo Avers straw pellet boilers have been installed with support of project: site visit and interview with Mr. Volodymyr Valentynovych Verbitskiy, Director of National Ecology and Nature Center and Professor 5-6. PM of UNDP-GEF *EE Buildings Project*, which was to share Project's Financial Mechanism: Mr. Sergeii Varga
Sept. 15 (Sunday) Kiev
5-7. Second and current CTA to the Project (second meeting): Mr. Paata Janelidze, also Advisor to Energy and Environment Portfolio of UNDP Ukraine
Sept. 16 (Monday) Kiev (*evening transit to Odessa*)
6-1. Avers (Company providing 12 straw pellet boilers in early part of project) – Mr. Dimitriy Muravsky, Managing Director 6-2. First Chief Technical Advisor (CTA) to the Project (2016-2018) *via Skype*: Ms. Marina Olshanskaya, CEO, AvantGarde Energy 6-3. Second UNDP CO Programme Analyst responsible for Project: Ms. Olena Maslyukivska-Samberg, Business Development and Innovation Analyst, UNDP Ukraine 6-4. Second Project Manager of Bioenergy Project: Mr. Yevghen Groza
Sept. 17 (Tuesday) Odessa (*evening transit to Kiev*)
7-1. Odessa Regional 11th Clinical City Hospital: Site visit to completed 4.5 MW biomass boiler project (for heating), design of which was supported by UNDP-GEF Project in 2018. Attendees: (1) Mr. Yevgeny Teplitsky, Director of Project and Programs/ Director of Odessa Development Agency ("Odessa 5T"); (2) Mr. Vitalii Savych, Chief of Energy Efficiency ("OMEA"), Odessa Development Agency; (3) Representative of Company Investing in Biomass Boilers (main business swimming pools); (4) Representative of Company Handling Design and Construction (individual was involved in

construction aspects of project); (5) Deputy Chief of Facilities Team of Odessa City Clinical Hospital No. 11 7-2. Odessa Psychiatric Hospital: Pipeline project 2.5 MW biomass (for heating) and attendees 1, 2 and 3 from site visit above 7-3. Odessa Development Agency: Meeting in office to review strategic plans for district heating with attendees 1 and 2 from site visits
Sept. 18 (Wednesday) Kiev
8-1. EBRD: Mr. Oleksandr Nikolaienko, Energy Efficiency and Climate Change Principal, European Bank for Reconstruction and Development 8-2. International Consultant for Biomass Financial Support Mechanism (2015-2019): Mr. Michael Devoe 8-3. Lead Policy Expert and Preparer of Municipal Biomass Guide for Project (2015-2018) *via Skype*: Mr. Oleksandr Ignatenko, Professor of the Department of Economic Policy and Governance, National Academy of Public Administration under the President of Ukraine 8-4. M&E Team of UNDP CO: Ms. Yuliya Petsyk, Director of M&E; and Ms. Polina Nezdiikovska, Manager of M&E for Energy and Environment Portfolio 8-5. GIZ Ukraine: Mr. Pavlo Masiukov, Senior Project Coordinator, Support for the Establishment of an Emissions Trading Scheme (ETS) in Ukraine; Designer of Proposed Bioenergy Project
Sept. 19 (Thursday) Kiev
9-1. Expert on Establishment of an Interagency Biomass Working Group (2017-2018): Mr. Anatolii Kutsevol, Director of Reform Support Team, Ministry of Ecology and Natural Resources 9-2. Senior Biomass Expert to Project Leading Investment Promotion in Municipal Use of Biomass (2018-2019) (second meeting): Mr. Georgii Geletukha, Director of Scientific Engineering Center for "Biomass" 9-3. Senior Technical Expert Leading TOR Preparation for 9 of Project's Biomass Boiler Project Designs (2019): Ms. Juliia Usenko, also Founder of NGO Sustainable Development Investment Agency (SDIA) 9-4. Bioenergy Expert for the Project Conducting Feasibility Studies for Municipal Bioenergy Projects (2018 – 2019): Mr. Oleksii ("Alex") Epik, Senior Consultant of Scientific Engineering Center for "Biomass" and Researcher of Institute of Engineering Thermophysics of NASU 9-5. Bioenergy Expert for Conducting Feasibility Studies for Municipal Bioenergy Projects (2018-2019): Mr. Viacheslav ("Slava") Antonenko, Consultant of Scientific Engineering Center for "Biomass" 9-6. Consultant on Content Management, Information, TOR Preparation, and Reporting Support for the Project (2016-2018) *via Skype*: Ms. Natalia Olshanska, Consultant to UNDP Ukraine on Project Implementation
Sept. 20 (Friday) Kiev
10-1. Project Policy Expert Preparing Draft Incentive Policy for Bioenergy Crops (2019): Ms. Anna Pastukh 10-2. Project Biomass Support Unit Establishment Expert (2015-2016): Mr. Oleksandr Anatoliiovych Arapov 10-3. Regional Technical Advisor (RTA) on Climate Change Mitigation, Istanbul Regional Hub, UNDP Regional Bureau for Europe & CIS: Mr. John O'Brien (*via Skype*) 10-4. TE Mission Debrief with UNDP Resident Representative to Ukraine, Ms. Dafina Gercheva and also with Ms. Alla Tynkevych, Programme Analyst, UNDP CO; Mr. Paata Janelidze, Advisor to UNDP CO on Energy Environment Portfolio and CTA to *Bioenergy Project*; Mr. Andriy Zayika, Portfolio Manager, UNDP CO; and Ms. Yuliya Petsyk, Head of M&E, UNDP CO.

3. Post-Mission (all via Skype, unless noted to be by email)

Date	Name, Role, and Organization
Oct. 9, 2019	International Consultant for Biomass Financial Support Mechanism (2015-2019) (*follow-up interview*): Mr. Michael Devoe
Oct. 14, 2019	Mr. My Ton, international expert who was part of team conducting terminal evaluation of Ukraine UNDP-GEF *Energy Efficient Lighting Project*
Oct. 14, 2019	Regional Technical Advisor (RTA) on Climate Change Mitigation, Istanbul Regional Hub, UNDP Regional Bureau for Europe & CIS: Mr. John O'Brien
Oct. 15, 2019	Ms. Victoria Semenenko, MMKG majority owner and director of MMKG at time of awareness work for the project (*via email, as interviewee not available in person during mission nor via Skype after*)
Nov. 14, 2019	Mr. Sergey Faschevsky, Consultant at Norsk Energy providing support during project design phase, including preparation of *Bioenergy Technical Guidebook*, TOR for municipal competition for bioenergy project support, and presentations at two workshops

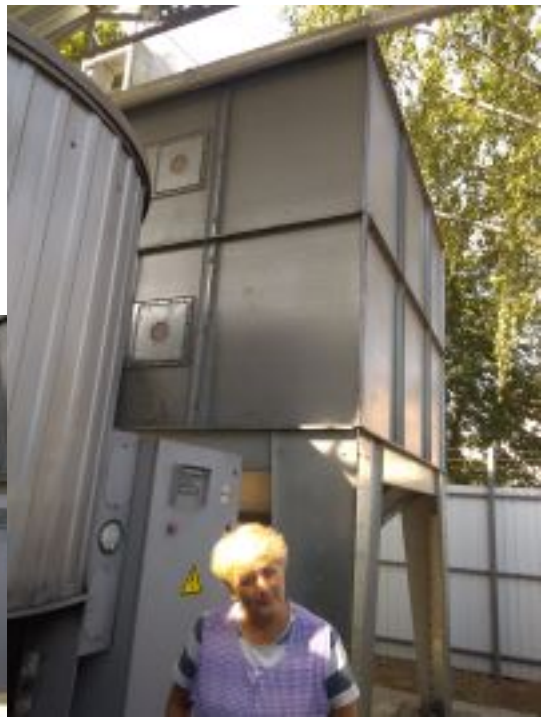
Annex 2. Summary of Field Visits

Introduction: This annex reviews the field visits undertaken during the TE mission in September 2019. The field visits include: Uman, Palanka, Zhytomyr, National Ecology and Nature Center in Kyiv, and Odessa. Each field visit is described briefly below, with emphasis on the site visits. Findings from meetings are incorporated more broadly into the main text of the TE report.

Uman field visit: On September 11, 2019, the TE team travelled to Uman, a city with population of about 83,000 in Cherkasy Oblast in central Ukraine, and had two meetings and one site visit. The meetings were with: (1) Deputy Mayor of Uman, Mr. Serhii Kochko; and (2) Mayor of Uman, Mr. Oleksandr Tsebriy, also with Head of Department of Housing and Communal Services of Uman City Council – Mr. Vitaliy Kharchenko – in attedance. The site visit included (3) discussions with Mr. Kharchenko and visits to a school that had installed a 220 kW straw pellet Avers boiler procured by the *Ukraine Municipal Bioenergy Project*. According to sources in Uman, the project has covered the cost of the boilers and their installation, while the city or schools provided 15% co-financing for related infrastructure. The division of Avers that produces straw pellets and fabricates straw pellet boilers is located in Uman, though was not visited by the TE team.

Findings from site visit: Overall in Uman, three Avers boilers have been installed in three different schools, one of which was visited by the TE team. The fuel savings over three years for each boiler was about UAH 1 million (USD40,000), or averaging about USD 13,000 per boiler per year. There is no problem with smoke from the boilers. There is annual maintenance, which Avers provides for free, in exchange for being able to collect data on the boilers. One issue is that there has been an increase in pellet prices for the schools from UAH 2,036 per ton in 2018 to UAH 3,200 per ton in 2019. A company comes to load 17 tons of fuel at a time, which lasts roughly one month. The pellet storage tank into which fuel is loaded is hermetically sealed.

Left: View of project provided Avers straw pellet boiler at school in Uman. Right: Same school, showing both boiler and pellet storage tank - a hermetically sealed container.



Palanka field visit: Also on September 11, 2019, the TE team travelled to Palanka, a federation of villages located in Uman Rayon, Cherkasky Oblast. While in Palanka, the team met with the following persons in a group: Deputy Mayor of Palanka Federation – Mr. Myclashchuk Ihor; Mayor of Palanka Village – Ms. Panasiuk Halyna; Head of International Cooperation – Ms. Natalia Stanislavchuk; and Businessman – Chekalenko Vasyl (director of LLC "Berestovets"). The group meeting was conducted concurrent with a site visit to one of the three schools where the federation is planning to install straw briquette boilers based on the detailed technical design supported by the *Ukraine Municipal Bioenergy Project*.

The new biomass boilers will replace old, fossil fuel boilers that are 40 to 50 years old. Palanka has moved at a rapid pace with the first project and has already started to prepare the ground for the installation there. Straw is produced in the community, where they also have the capacity to produce briquettes and pellets. Indeed, they heard about the opportunity to work with the *Ukraine Municipal Biomass Project* through a local pellet supplier who is supplying straw pellets to the Avers boilers in Uman and thus heard about the opportunity while there. The total project cost at the first school is USD149,000 and about USD105,000 each at the other two schools. The boilers will be 220 kW each. They will be hand loaded (not automatic loaded). For the first site, which the TE team visited, they are re-doing their underground piping and installing new windows for an improved building envelope. The TE team saw that they had also installed new radiators in the school. Palanka has about 30 other potential sites that they would also like to transition to biomass over the next ten years. The area is villages and there is no district heating – so all boilers are independent/ off-grid. The federation was just established about two years ago, so they may not have a long enough history to take out bank loans.

Upper left: Palanka discussion group (Vice Mayor of Village, National Consultant IK, Deputy Mayor of Federation, Agri-businessman, Director of International Cooperation) with construction site for boiler house in background. Upper right: Construction site for boiler house. Lower left: Inside school building to be heated with new heating unit in place that will be part of new heating system.

Zhytomyr field visit: On September 12, 2019, the TE team travelled to Zhytomyr, a city with population of about 266,000 in Zhytomyr Oblast in northwest of Ukraine, and had three meetings and two site visits. The meetings were with: (1) Zhytomyr City Government and Education Sector Stakeholders: Deputy Mayor – Ms. Oshansak Neten; Deputy Director of Construction – Mr. Alexander Dikhtiar; Deputy Head of Energy Efficiency – Mr. Alexander Honcharuk; Director of school with two project-donated straw boilers – Mr. Melnyk Mykola; Director of kindergarten with project-donated straw boiler: Ms. Hut Nataliia. (2) *Ukraine Municipal Bioenergy Project*'s lead technical consultant for supervision of design, quality, monitoring and technical assistance for biomass projects: Ms. Svitlana Yarosh. (3) Zhytomyr Municipal Enterprise: Mr. Dmytro Rogozhyn, Director, Zhytomyr Municipal Enterprise of Zhytomyr City Council, and Academician of Engineering Academy of Ukraine. Four of the project's Avers-produced straw pellet boilers are in Zhytomyr, two at one school, one at a kindergarten, and another one at a technical institute. The TE team conducted site visits to the school with two boilers and the kindergarten with one boiler.

Left: Zhytomyr school with two Avers boilers: one boiler and pellet storage. Right: Kindergarten with one Avers boiler – fenced area with boiler and pellet storage tanks (behind boiler), as well as dumpster for ash (in front of boiler).

From the two site visits, the TE team learned that the storage tank into which the straw pellets are automatically loaded holds about 15 tons of pellets. In the most severe cold 1 ton might be used in one day, but otherwise 500 to 600 kg per day are used. There has been a lot of maintenance at the school, as they had issues with pellet quality last year. They are now getting their pellets directly from Avers again; and the quality is good. The kindergarten is having an issue with the ash, as no one will take it away anymore. Yet, despite challenges, stakeholders indicate that they still find the straw pellet boilers beneficial. The school, for example, has a gas boiler, but is no longer using it. At the kindergarten, the boiler has been stopped for maintenance two times in four years, so it is not such a problem. They have gas backup boilers they can use when the biomass boilers are under maintenance.

National Ecology and Nature Center, Kyiv, field visit: On September 13, 2019, the TE team visited the National Ecology and Nature Center in Kyiv, meeting with Mr. Volodymyr Valentynovych Verbitskiy, Director of National Ecology and Nature Center and Professor, who also took the TE team on a site visit of the Center's three Avers straw pellet boilers procured by the project.

The cost of the pellets for the first year was included in the grant from the project, though since that time they've had to procure their own pellets and have switched suppliers. The price of straw pellets has risen from UAH 400 per ton four years ago to UAH 3,200 per ton today. Overall, savings has been 55% if the cost of pellets and maintenance is compared to the cost of gas. They pay about USD 3,600 per year to Avers for maintenance. There is a challenge that the *Ukraine Municipal Bioenergy Project* targeted for

the Nature Center to use the money saved on fuel for more energy efficient windows, but the way their institutional system works, they are not allowed to keep the money they save on fuel.

One of three project-procured 220 kW Avers straw pellet boilers installed at the National Ecology and Nature Center in Kyiv.

Odessa field visit: On September 17, 2019, the TE team visited the city of Odessa in Odessa Oblast, which has a population of about 993,000 and is a port city on the Black Sea in southern Ukraine. The *Ukraine Municipal Bioenergy Project* has provided support to Odessa for the technical design of three municipal agri-biomass boiler systems. Already, one of these systems has been installed with private sector investment. While in Odessa, the TE team visited the completed system at the Odessa Regional 11th Clinical City Hospital and visited the site for one of the other two pipeline projects at the Odessa Psychiatric Hospital. During these visits, the TE team had the opportunity to speak with the Odessa Development Agency, the private sector investor that invested in the first system, Hospital #11's facilities lead, and the company that carried out the technical design and construction of the biomass boiler system installation at Hospital #11.

The Hospital #11 biomass boiler project, which uses sunflower husk as fuel and includes three new boilers, was completed in March 2019. The Hospital is located in the Slovaka District in the city, which has a lot of off-grid systems that could benefit from more biomass boiler projects. The private sector entity invested in the project on the premises of the hospital and will sell heat to the hospital with just one-year contracts. The private sector entity rents the boiler building with a three-year contract. The project has two parts: the boilers inside the building and the tank of pellets outside the building. The installed boilers are each 1.5 MW, for a total of 4.5 MW. Total project cost is USD 440,000, of which USD 280,000 was for the boilers and manual system, with the remainder for revitalization of the building and automating the system feeding the fuel. Payback is expected to be five years. Based on the new policy, the tariff will be 90% of the gas heating tariff. The investor had previously done a project nearby

for 2 MW, which had a very high IRR – 30 to 40%. *Ukraine Municipal Bioenergy Project* support for the design of the 4.5 MW project, according to stakeholders, moved the project to the front of the pipeline for the investor – otherwise it might have taken some more years to implement. As for the loading set-up, the investor found it is cheaper to load the pellets into underground storage. This saves money as compared to their first project for which they had to purchase pellets in bags, which raises costs. In the new project, a motor is used to move the pellets from underground storage to a high level from where they are then dropped down on their way to the building. With this set up, they can store 70 tons of sunflower husk pellets at a time.

Left: Two of the three boilers of Odessa #11 Hospital 4.5 MW sunflower husk boiler system. Right: Feeder at Odessa #11 Hospital (holding the feedstock) for one of the boilers.

Left: Boiler house at No. 11 Hospital that is rented by private company for the biomass boilers. Right: Pellet tank, with cover of underground pellet storage area in the foreground. It's cheaper to dump pellets into underground storage and use a motor to lift them than to buy bagged pellets and have a crane to lift deliveries to high storage tank directly.

The Psychiatric Hospital, Odessa Hospital #8, is planning a 2.5 MW project, with technical design supported by the *Ukraine Municipal Bioenergy Project*. The TE team was able to view the proposed site. The fuel will also be sunflower husk at this site.


Left: This is a second possibility building where the biomass boilers may be placed at the Psychiatric Hospital in Odessa. Right: This is in the first possibility building at the second site (Psychiatric Hospital), where boilers might be placed. This is a center for branching of the heating piping and also includes water heating equipment.

Annex 3. Documents Reviewed

The documents reviewed for the terminal evaluation are listed below, organized into 4 groups, which are: (1) PIF Stage Documents (early concept stage of project), (2) Full-Scale Design and Project Management Documents, (3) Documents Related to Individual Contracts, and (4) Documents Related to Contracts with Organizations.

1. PIF Stage Documents
1. PIF (initial submission September 2010, final resubmission December 20, 2011)
2. Request for PPG Funds (November 2011)
3. GEF Review Sheet (review of PIF)
4. STAP Review Sheet (review of PIF, April 2012)
5. PPG Initiation Plan

2. Full-Scale Design and Project Management Documents

A. Full Project Design Documents and Project Launch
1. ProDoc
2. CER
3. CEO Endorsement Letter
4. Revised logframe signed by country office leadership, but not approved by UNDP-GEF team (undated)
5. Social and Environmental Screening Summary
6. LPAC Minutes (undated, presumed 2014)
7. Inception Report

B. Monitoring and Reporting Documents
1. Project Implementation Reports x 5 (2015, 2016, 2017, 2018, and 2019)
2. Project Progress Report x 2 (2015 and 2016)
3. Mid-Term Review Report
4. CCM Tracking Tool dated Aug. 22, 2019 and explanatory note
5. Oversight mission reports (27 brief trip reports) prepared by various Bioenergy Expert Roster members
6. Project Board Minutes x 4 (2015, 2016, 2017, and 2018)
7. CDRs by activity for 2014, 2015, 2016, 2017, 2018 and 2019 (up to Aug. 16, 2019)

3. Documents Related to Individual Contractors (ICs)
1. Various reports prepared by policy consultants (*in Ukrainian*)
2. Various reports prepared by consultants under Biomass Support Unit Component (*in Ukrainian*)
3. Feasibility studies prepared by Biomass Expert Roster consultants (*in Ukrainian*)
4. Final Report on Development, Implementation, and Recommendations by International FSM Consultant (English, 9 pages)
5. Municipal Biomass Guide prepared during full project implementation (*in Ukrainian*)
6. Biomass Guide prepared during PPG phase (*in Russian*)
7. GHG Emissions Reduction Analyses x 2 reports (*in Ukrainian*)
8. Bid-related documents and bid evaluation reports for selected IC procurements

4. Documents Related to Contractors that are Organizations

A. Component 1 - Policy
1. Analytical Report "Legislation and Legal Acts of Ukraine in the Field of Use of Bioenergy Technologies in the Municipal Sector: Barriers, Obstacles, and Opportunities." (*in Ukrainian, 150 pages – prepared by NGO contractor*). Also, relevant procurement notice and contract.

B. Component 3 – Installations and Financing - AverTech Straw Pellet Boiler Demos (12 boilers)
1. Q&A including minutes of pre-bidding conference held in the UN office on Nov 14, 2014
2. Procurement notice
3. Contract, contract expansion and extension, bid evaluation report, various other bid documents

C. Component 3 – Installations and Financing - Pellet Market Study and Boiler Market Study
1. Analysis of Ukrainian Biomass Pellet Market, 2016 (*299 pages, in Ukrainian*)
2. Analysis of Ukrainian Biomass Boiler Market, 2016 (*139 pages, in Ukrainian*)
3. Bid evaluation report for boiler market study procurement
4. Bid evaluation report for pellet market study procurement
5. Justification for direct contracting for pellet market procurement

D. Component 3 – Installations and Financing - IFC work on Financial Support Mechanism
1. Project Completion Report by IFC (English, 9 pages)
2. Commercial Lending Capacity to Small and Medium-sized Business in the Sector of Bioconversion Projects, June 2017 (English, 41 pages, by IFC)
3. Development of Municipal Borrowing in Ukraine: International Experience and Recommendations July 2017, (English, 31 pages, by IFC)
4. Guidelines for Municipalities: Obtaining Bank Financing for Implementation of Energy-Efficiency and Renewable-Energy Projects, Oct. 2017 (English, 27 pages, by IFC)
5. Municipality Credit Risk Assessment: Guidelines for Banking Institutions, June 2018 (English, 37 pages)
6. IFC Jan. 2018 presentation on Municipal Lending
7. Agreement between IBRD and UNDP

E. Component 3 – Installations and Financing -Grant Payments to NoSEP (Analytical Center for New Social and Economic Policy) NGO for energy efficiency monitoring system
1. Memos on project "loan" to make payment toward NoSEP grant
2. Grant agreement, financial reports, program report

F. Component 3 – Installations and Financing - Grants to 3 Different NGOs for Energy Plantation Planting
1. Documents related to NGO Skyrokyi Step willow plantation work in Ivano-Frankivsk (various reporting and payment documents)
2. Documents related to NGO Ecomerizha Step willow plantation work in Poltava (various reporting and payment documents)
3. Documents related to NGO Molochay willow plantation work in Zakarpattia (various reporting and payment documents)

G. Component 3 – Installations and Financing - Grant to Novyi Svit for Pellet Quality Study
1. Progress reports and payment records
2. Mid-term report and final report
3. Various documents related to competition for grant

H. Component 4 – Awareness - MMKG Awareness/ Training Assignment
1. MMKG Final Report on Awareness
2. RFP, proposals, bid evaluation report for awareness/ training contract, various other bid-related documents, documents related to early termination of contract

I. Component 4 –Awareness - Other Activities
1. Documents related to inception workshop procurement
2. Agenda for 2015 study tour to Sweden, attendees list for 2015 study tour to Sweden, payment voucher for 2015 study tour to Sweden
3. REA-prepared brochures and training materials on agri-bioenergy
4. Procurement, payment, and notes to file documents related to various conferences and study tours

Annex 4: Ratings and Explanation

Ratings for the project, as required by the TE TOR, are given in the table below. The rating scales based on guidance for TEs of UNDP-GEF projects are given below the table. Then, the TE team's reasoning for the ratings given is discussed.

Evaluation Ratings:			
1. Monitoring and Evaluation	***rating***	**2. IA& EA Execution**	***rating***
M&E design at entry	MS	Quality of UNDP Implementation	MS
M&E Plan Implementation	MS	Quality of Execution - Executing Agency	NA
Overall quality of M&E	MS	Overall quality of Implementation / Execution	MS
3. Assessment of Outcomes	**rating**	**4. Sustainability**	**rating**
Relevance	R	Financial resources:	ML
Effectiveness	MS	Socio-political:	L
Efficiency	MS	Institutional framework and governance:	L
Overall Project Outcome Rating	MS	Environmental:	L
First 3.5 years[12] Overall Project Outcome Rating	*MU*	Overall likelihood of sustainability:	ML
Last 1.5 years Overall Project Outcome Rating	*S*		

Rating Scales based on Guidance for TE of UNDP-GEF Projects

Ratings for Outcomes, Effectiveness, Efficiency, M&E, I&E Execution
6: Highly Satisfactory (HS): The project had no shortcomings in the achievement of its objectives in terms of relevance, effectiveness, or efficiency
5: Satisfactory (S): There were only minor shortcomings
4: Moderately Satisfactory (MS): There were moderate shortcomings
3. Moderately Unsatisfactory (MU): The project had significant shortcomings
2. Unsatisfactory (U): There were major shortcomings in the achievement of project objectives in terms of relevance, effectiveness, or efficiency
1. Highly Unsatisfactory (HU): The project had severe shortcomings

Sustainability
4. Likely (L): negligible risks to sustainability
3. Moderately Likely (ML): moderate risks
2. Moderately Unlikely (MU): significant risks
1. Unlikely (U): severe risks

Relevance
2. Relevant (R)
1. Not relevant (NR)

Impact Ratings
3. Significant (S)

[12] Project altogether has a duration of 5.5 years. Roughly speaking, the first project team was in place the first 3.5 years. After that there was an interim period of almost 0.5 years in which not much happened. The new project team was in place roughly the last 1.5 years.

2. Minimal (M)
1. Negligible (N)

Explanation of Ratings Given

M&E design and implementation and M&E overall are rated as "MS." As for design, the Project Results Framework (table of project indicators) has several deficiencies. Sometimes the indicators and the targets do not match; and some of the indicators are not very specific or measurable. Please see the discussion at the top of Annex 6 for more details. As for M&E implementation, the project appears to have done well in preparing its project reporting in a timely fashion; and the MTR and TE were also carried out in a timely fashion. Yet, as indicated in this report, there were problems during the first 3.5 years of the project with direction and with cost effectiveness. Despite concerns at the time on the part of the RTA, documented very clearly as early the first PIR in summer of 2015, M&E implementation was not strong enough to result in a deeper dig into matters to understand the problems and get the project on the right course until about 3.5 years into implementation.

As for project outcomes, the overall project outcome rating is MS. If this rating were broken down by the two phases of the project (and not including the roughly 0.5 year interim period of downtime between them), the first 3.5 years might receive an MU and the last 1.5 years, an S. The TE found a lack of focus and lack of congruence with the project document during the first 3.5 years of implementation. The most major issue is that the project decided to procure a substantial number of boilers and their installation at high cost using 100% GEF funds, with only minimum other investment, such as for the cement bases. Twelve boilers were installed across 8 sites, so counting as perhaps 8 projects. The high-cost boilers purchased did not stimulate any replication. And then, the project team tried to reduce its target of boiler installations and shift a substantial amount of funds to a large training contract (of about USD 753,000) that did not seem appropriate in its large number of trainings (338) and its lack of attention to the financing aspects of the project design. The last 1.5 years, the new project team has put the project back on track with great progress towards its main aim of stimulating substantial municipal bioenergy installations, with the development of 48 pipeline projects, many of which are expected to be realized, thus facilitating achievement of the direct GHG ER targets as indicated in project design.

Effectiveness is rated as MS. Review of the indicator table in Annex 6 along with ratings by indicator may provide some insights on why the TE team gives the project an MS rating for effectiveness. The project is on-track to achieve direct GHG ER targets, though much of the installations will occur after project close. The project will fall far short of achieving the GHG ER target for during-project emission reductions. As for the policy component, the TE team feels the project fell far short in achieving its targets for policy achievements, though these were not that well defined. The project claimed four policy achievements, but TE findings suggest the project was not the main force leading to these achievements, playing a minor role if any. Yet, progress towards the second outcome, for which the project developed and got adopted eight oblast-level bioenergy plans, is more impressive. The main concern is that there was no further support from the project for implementation, so there is a good possibility these plans may sit on the shelf. As for the biomass support unit and capacity built for that unit, the second component, the project never got very far in establishing such a unit. Had the government partner been SAEE in the first 4 years of the project, there may have been more of a chance of success. The private sector roster of bioenergy experts (9 persons), however, has demonstrated capacity developed as this promising team develops their skills in liaising with municipalities and assisting them in assessing the financial viability of municipal bioenergy projects. The biomass working group, also supported as a part of this component, did not address the project's main area of agro-biomass and did not continue after five meetings, once project support stopped, though had the interesting benefit of providing input that resulted in German funding of € 7 million for bioenergy in Ukraine in coming years. As for achievement of component 3's outcome, the pipeline of 48 municipal bioenergy projects is really the star achievement of this project.

This pipeline is resulting in implementation of real projects with, in most cases, no investment from the project past the feasibility study and detailed design phase. With 35 municipalities involved, the impact on awareness is quite wide. Also related to Component 3's outcome, as discussed above, the 12 biomass boilers from the early phase of the project are viewed less favorably given that the procurement and installation was 100% financed with GEF funds. Yet, findings show even these boilers have had an impact on the thinking and plans of some municipalities. The financial support mechanism work of Component 3 has led to the important development of the restart of municipal loans in Ukraine. Yet, more work is needed to move beyond the one such loan for bioenergy and the low level of loans to small and medium sized cities. Lastly, with regard to Component 4's outcome, awareness has been raised, as noted, by the 48 projects, the domestic study tour, and other work of the project. To wrap up work towards this outcome, it would be good to have a compendium of 1 or 2 page case studies for as many of the 48 pipeline projects as are determined to be attractive in their financial viability.

As for efficiency, also called cost effectiveness, here the first 3.5 years of the project and (after the 0.5 year interim period) the last 1.5 years also diverge, thus yielding an overall rating of MS. The TE team found concerning cost effectiveness problems with some of the contracts of the first phase. The Avers boilers were much more expensive than their current market price would imply. The large awareness contract could probably have been achieved for one-third of the price. And, the NGO plantation grants also seem quite over-priced in terms of area planted.

UNDP Implementation and Overall Implementation are both rated as MS. They are essentially the same item, as the project was directly implemented by UNDP. As discussed in this report, the TE team has concerns about the ad hoc nature of the Project Board. Also, it seems the project did not select the optimal government partner unless the last 1.5 years. The focus on results was also improved the last 1.5 years. A special weakness of the project is in the area of adaptive management. The project team the first 3.5 years found some of the outcomes not very easy to make progress on and seemed to give up, declaring them impossible, rather than persevering and thinking out of the box for adaptive management approaches. This is true with regard to the biomass support unit and also with regard to the financial support mechanism. The second project team did not have much time left, so chose to focus on developing a pipeline of municipal bioenergy projects. The TE team believes this was the right choice, but this has left the policy outcome, the biomass support unit outcome, and the financial support mechanism of the third outcome not fully addressed. One notable problem with implementation occurred with the very large procurement contract during the first phase of the project. The UNDP-GEF team did not agree that funds could be shifted from the investment outcome to pay for this USD 753,000 awareness contract. This led to an extended standstill in project progress. The TE team feels that this reflects a general problem in the first 3.5 years of the project that the UNDP-GEF team offered on-track suggestions and expertise, but did not get appropriate follow up from the project team. In the future, it seems important for CO leadership to understand the philosophy and requirements of UNDP-GEF projects and to ensure that UNDP-GEF feedback is properly integrated into project implementation.

Sustainability is rated as ML. Most types of sustainability were rated L, but financial sustainability is rated ML. Financing of municipal biomass projects was a major aspect of project design, but progress was slow in developing the financial support mechanism; and high interest rates inhibit municipal loans, even though the project has made these now a possibility. If a large number of the pipeline projects cannot get financed, that will reduce the impact of the project. Current socio-political and institutional trends appear to support the sustainability of municipal bioenergy. With decentralization, cities have more control over their budgets. And, now, federations of villages, which can also carry out bioenergy projects, are being formed. High natural gas price trends in Ukraine are expected to continue, thus serving as a driver towards demand for municipal bioenergy projects, which lower energy costs. Environment-wise, municipal bioenergy projects provide strong GHG ER benefits. Some stakeholders mentioned issues with emissions of biomass boilers, which is something future work may do well to address.

Annex 5. Evaluation Matrix

Questions	Indicators	Sources
Relevance: How does the project relate to the main objectives of the GEF focal area, and to the environment and development priorities at the local, regional, and national levels?		
1. Does the project focus on an area that has high potential for GHG ERs?	-Proportion of municipal heating/ hot water in total energy use. -Projected growth of biomass use in heating and role of agro-biomass in that growth	-Bioenergy Association experts, presentations, and reports -*as above*
2. Is the project in-line with the needs and priorities of the country and its municipalities?	-Top concerns of municipalities and communal services companies -Priority areas for RE and EE in national energy strategy	-Interviews with municipalities and communal service companies -National documents including *Ukraine Energy Strategy*
3. Is the project addressing a need that will not easily be addressed without the project?	-Number of donor projects with main focus on municipal bioenergy and on agri-bioenergy -Agri-bioenergy heating capacity to date	-Interviews with other donors, review of documents related to donor projects, consultation with Ukrainian bioenergy experts
Effectiveness: To what extent have the expected outcomes and objectives of the project been achieved?		
1. Has the project created a complete policy framework conducive to development of municipal bioenergy?	-Number and nature of new policies related to bioenergy that are attributable to project	-Expert consultations; project reports for policy component; review of legislation; online search
2. Has the project built capacity in municipal bioenergy and set up an entity that can support the development of municipal bioenergy projects?	-Existence of long-term unit to provide support to development of municipal bioenergy projects -Number of experts providing support to municipal bioenergy projects whose capacity has been substantially improved	-Expert consultations -Interviews with bioenergy experts regarding their work; project Bioenergy Expert roster
3. Has the project resulted in a substantial number of municipal agro-bioenergy projects that are being or will be replicated?	-Existing bioenergy installations resulting from project -Pipeline projects resulting from project and likelihood of implementation -Replication bioenergy projects resulting from project	-Stakeholder interviews and materials provided by project team -*As above* -*As above*
4. Has the project set up a financial support mechanism that will facilitate the financing of municipal bioenergy projects so that more such	-Existence of new financial support mechanism for municipal bioenergy projects that did not exist before project and is due to project	-Consultations with banks and with project team; review of documents prepared as part of financial support mechanism work; review of Ministry of Finance information on municipal loans from domestic banks

projects will be realized than would have been in the absence of this mechanism?	-Number of bioenergy projects supported by new financial support mechanism	-Consultations with banks
5. Has the project built awareness of municipalities regarding bioenergy that is resulting in their taking clear actions to develop bioenergy projects?	-New plans for bioenergy projects in municipalities in cases for which the municipalities had been supported by the project and attribution to the project	-Consultations with municipalities
Efficiency: Was the project implemented efficiently, in-line with international and national norms and standards?		
1. Was the cost of the 12 Avers straw pellet demo boilers of the project reasonable and results valuable?	-Cost of straw pellet boilers of 220 kW -Plans for replication of Avers boilers	-Market information, consultations with bioenergy experts, Avers contract -Consultations with municipalities, manufacturers, etc.
2. Was the cost of the large awareness contract reasonable and results valuable?	-Cost per training for bioenergy trainings -Evidence that trainings have led to new projects -Evidence that trainings have led to municipal bioenergy loans	-Contract size, consultation with contractor and subcontractor, input from other stakeholders -Consultation with expert team carrying out training and feasibility study work -Consultation with expert team and with banks
3. Was the cost of the five grants under the project reasonable and were the results valuable?	-Cost per ha of project's willow plantation -Cost per ha of willow plantation in other places -Evidence that project willow plantations have led to replication -Evidence of use made of the pellet quality study -Evidence of use made in the bioenergy field of the energy efficiency monitoring work	-Project documents -Consultation with experts, review of online sources -Consultation with NGOs carrying out plantation work and with other stakeholders -Project reports, consultation with experts *-As above*
4. Were other contracts of the project a good use of money in terms of how they contributed to achievement of the project objective and outcomes?	-No. of project activities assessed to directly lead to municipal bioenergy installations or a change in bioenergy policy	-Reports prepared by various project activities and consultations with stakeholders
Sustainability: To what extent are there financial, institutional, socio-economic, and/or environmental risks to sustaining long-term project results?		
5. Will bioenergy projects stimulated by the project get financed without continuing project support?	-MW of pipeline projects likely to be implemented -Number of projects getting financing before project close	-Lists of projects provided by project team; consultations with municipalities and experts *-As above*

6. Will the activities of the project be seen to have served as a stimulus of municipal bioenergy projects after project close?	-Number and capacity of replications not supported in any way by the project	-Consultations with municipalities and project experts
7. Will the institutional and socio-economic environment continue to be supportive of municipal bioenergy projects after project close?	-Position (positive or negative) of key government agencies on municipal bioenergy -Economic benefits and costs of shifting from gas or coal to bioenergy for municipal heating	-Stakeholder consultations -Bioenergy association, stakeholder consultations
Impact: Are there indications that the project has contributed to, or enabled progress toward, reduced environmental stress and/or improved ecological status?		
1. Some municipalities have very big plans for the expansion of biomass. Did the project play a role in this?	-Bioenergy capacity targeted by Zhytomyr and attribution of plans -Bioenergy capacity targeted by Odessa and attribution of plans	-Stakeholder consultations and documentation of municipal bioenergy plans of Zhytomyr *-As above, but for Odessa*
2. Ukraine has limited forest cover and growth of wood biomass presents a risk to this. Has the project successfully steered Ukraine to a more agri-biomass and/or energy crops biomass path, so that forests will not be degraded?	-Increased pipeline of agri-bioenergy projects and attribution -Views of key government stakeholders with regard to agri-bioenergy	-Project records and stakeholder consultations -Stakeholder consultations
3. Is there evidence of mindset change attributable to the project that may result in long-term focus on bioenergy in Ukraine?	-Mindset change in favor of bioenergy and/or agri-bioenergy among municipal leadership and attribution thereof -Mindset change in favor of bioenergy and/or agri-bioenergy among key national level officials and attribution thereof	-Stakeholder consultations *-As above*

Annex 6. Indicator Assessment

The TE team found a number of weaknesses in the drafting and design of the project indicators and targets, as displayed in the Project Results Framework (which is a section of both the CER and ProDoc). These are explained in the text below. Then, our assessment of the objective and outcome indicators is given in the table below.

1. One key issue is that the indicators (shown in the "indicator" column) as phrased are sometimes quite different from the target (shown in the "target" column). That is, they describe different things. In some cases, the target is specific as an indicator should be, but the indicator is much more general. An example is that the objective indicator is phrased as "Municipalities/ Private Sector have operationalized direct investment in municipal biomass projects for heat and hot water supply." There are then 3 paragraphs of targets, which are more specific, such as by indicating targeted GHG ERs over lifetime of equipment installed directly due to project. A clearer way to do this may have been to have had separate indicators for each item in the indicator column, such as "GHG ERs over lifetime of equipment installed directly due to project" for one indicator and then the target column would only need to include the specific numbers and units, such as 361,000 tons CO2 in this case, rather than having to describe the indicator.

2. In some cases, the indicators (or target statements, which we find sometimes to include the real indicator statement, so in such cases, we treat them as the real indicators) are not specific or measurable enough. For example, the indicator for Outcome 4 (as included in the target cell) is "Increased awareness among stakeholders in place to promote and develop the market for municipal biomass." Another example is the Outcome 1A indicator which is: "Policy and legal/regulatory framework finalized, adopted and available for consultation by potential investors." It's not clear what the policy and legal/regulatory framework consists of. Interestingly, this "indicator" is actually included in the indicator column (inconsistent with some of the other rows where the indicator statements are actually included in the target column). For this indicator the target column includes: "To be completed within 15 months of recruitment of project manager and approved by Government 1.5 years after start of project." This range of the nature of what is included in the indicator column and the target column shows an inconsistent, haphazard approach to preparing the Project Results Framework.

3. There are some mistakes in terms of inconsistencies and redundancies in the indicators table. For example, the TE team has noticed some differences between the objective statement in the indicator table ("Project Results Framework") below and that given in the Project Framework (Section IB) of the CER. And, the "targets" for the objective indicator, which we take to really be the indicator plus the targets together in one column are redundant (361,000 tons CO2 target mentioned twice). And, there seems to be a mistake in the objective indicators/ targets. One target is 285 GWth associated with 63,577 tons CO2 ER, but another one 1,618,834 GWth associated with 361,000 tons CO2 target. Yet, the CO2 ERs should at least roughly scale with energy produced, so that one of the two GWth numbers, if not both, is wrong.

Further, the team learned that the project had prepared a revised Project Results Framework (i.e. indicator table) and that this had been signed by the UNDP Country Director and one of the UNDP CO Deputy Resident Representatives, as well as the first project manager. The signed revised results framework is not dated. Given the shortcomings of the indicators as outlined above, we might have expected that the revised version of the Project Results Framework would have "fixed" at least some of the items above. Yet, we found that most of the problems (aside from the objective

indicator target where the redundancy and second GWth target was removed) were not addressed. Instead, the main revision noticed is that the target for Outcome 3 was reduced from 18 municipal biomass boiler projects to 12 and an additional target related to the financial support mechanism was added. This corresponds with the TE team's impression that the project team had lost hope of stimulating any municipal boiler projects if they couldn't provide 100% of funds required for procurement and installation as they did with the first 12 boilers. Yet, this is completely counter to what the project was trying to do, with an aim of stimulating financially viable municipal biomass boiler projects that could be replicated on a wide scale. Further, as we note in our comments in the table, the 12 biomass boilers installed in the first part of the project don't represent 12 biomass boiler projects, as multiple boilers were installed at some institutions. In all, it appears these boilers were installed at 8 institutions, so count as 8 projects. To the TE team, it seems odd that the project manager would ask the CO leadership to sign such a document, though we are not familiar with whether this is common practice. Guidelines require that any changes to the results framework be approved by the UNDP-GEF RTA. Reducing targets is generally not encouraged and it seems would require strong rationale. In this case, reduction of targets seems particularly troublesome as the project, as noted, seemed in its first 3.5 years to have given up on its main job of stimulating municipal biomass boiler projects without 100% support of procurement and installation costs.

Project Objective and Outcome Indicators with EOP Status as Assessed by TE Team and with TE Team Rating and Explanation
Notes: First content of four columns taken directly from CER. Last two columns original content of TE team.
Outcome color codes as follows[13]: Green – achieved (Satisfactory = S), Yellow – partially achieved (Moderately Satisfactory=MS), Red – achievement very limited (Moderately Unsatisfactory=MU)

Strategy	Indicator	Baseline *(June 2014*	Targets End of Project *(Dec. 2019)*	End of Project (EOP) Status	Rating and Terminal Evaluation Comments
Objective: To assist the Government in addressing the barriers with a view to promoting municipal biomass for heating and hot water supply to communities in the Oblasts, through	Municipalities/ Private Sector have operationalised direct investment in municipal biomass projects for heat and hot water supply.	GHG in the municipal heating sector scheduled to increase from 434.4 million tCO_2 (in 2005, as per Ukraine's Third, Fourth and Fifth National Communications to UNFCCC prepared in 2009 (all three issued in one document)) to	285 GWh_{TH} in terms of heat and hot water generated (as a result of the 18 municipal biomass systems brought on-line) by project completion. Direct reduction of 63,577 tons of CO_2 over the 4-year FSP project life cycle and 361,000 over the full lifetime of the plants.	-Conservative estimate of direct CO2 emission reductions (ERs) [=ERs over lifetime of equipment installed due to direct influence of project activities]: 375,011 tons CO2 (as explained in Section 9 of this report). -Direct CO2 ERs during project estimated at 13,872 tons = 12,476 (10 Avers boilers for 4.5 years) +1,397 (Odessa Hospital #11 for 0.5 years) --based on CO2 avoided metrics of 2,772 tons per year for the first 10	**MS:** Two aspects to consider: 1. TE team estimates indicate project on-track to achieve targeted: a. "DERs" = lifetime GHG ERs from equipment installed as direct result of project activities (even if installed after project close) b. "CERs" = GHG ERs from equipment installed as indirect result of project or "replications" 2. But project achieved only about 1/5 of: c. DERs targeted to be achieved during

[13] Note: We have modified the meaning of the colors codes from that in the TOR as the TOR color code meanings seem more appropriate to a mid-term review. Yellow, for example, in that code is defined to be "on track to be met," which would be appropriate to an MTR but not as appropriate to a TE.

Strategy	Indicator	Baseline *(June 2014*	Targets End of Project *(Dec. 2019)*	End of Project (EOP) Status	Rating and Terminal Evaluation Comments
participation of the private sector.		as high as 740.7 million tCO_2 by 2030. The present contribution of biomass towards heat/hot water supply is estimated at 75 $GWh_{TH.}$ Negligible investments taking place in municipal biomass for heat and hot water supply.	1,618,834 MWhTH of energy generated, with a combined amount of CO2 reduced of 361,000 tons over the 20 year lifetime of the boilers installed during the project timeframe Estimated cumulative indirect GHG emission reduction of over 1.4 million tons of CO_2 by 2035 on the basis of a conservative policy scenario and a GEF causality factor of 80%.	Avers boilers and 2,793 tons per year for Odessa Hospital #11 boilers -Using bottom up approach conservative consequential ERs of 1,875,055 tons CO2 based on 5x replication of pipeline projects and no replication of Avers boilers	project lifetime. General conclusion: Project got behind during implementation due to lack of focus during first 3.5 years and will not meet target for GHG ERs to be achieved during project. Major changes to approach for its last 1.5 years (after the 0.5 year interim period when not much happened) allowed project to catch up so total GHG ERs due to project over lifetime of equipment will reach targeted amount. Yet, because installation and ERs achieved during project lifetime yield greater certainty than those achieved post-project, we give this a rating of MS instead of S.
Outcome 1A: Streamlined and comprehensive market-oriented policy and legal/regulatory framework to promote municipal biomass for heat and hot water services.	Policy and legal/regulatory framework finalized, adopted and available for consultation by potential investors.	None available at the present time.	To be completed within 15 months of recruitment of project manager and approved by Government 1.5 years after start of project.	It should first be noted that the indicator is not that specific, thus allowing for some leeway in interpretation. The project has claimed credit for four policies adopted. One of these is quite significant, because it allows those producing heating from biomass to charge 90% of the price of heat from natural gas whereas previously the allowed amount for biomass-generated heat pricing was cost +6%. Yet, consultations with key parties involved indicate that the project did not play a central role in the drafting and promotion of this policy or the others claimed.	MU: There are strong indications the project did not have as much of a role in getting the key policy (on pricing of biomass-based municipal heating) adopted as claimed. Further, other policies claimed were not only not verified to be due to the project but were also not as closely linked to bioenergy as would be expected given the outcome statement. For example, one of the claimed policies achievements was adoption of a policy that allows for ESCO contracts. While this may have some benefit to biomass installations (e.g. for long-term contracts between buyer and seller of heat), it was not promoted as such and main benefit is likely to be outside of biomass.
Outcome 1B: Municipal Targets	Confirmation that municipal	None available at the present time.	To be completed within 12 months of project	The project was responsible for the development of plans for bioenergy	S: While the indicator is "establishment of municipal targets," the TE team feels that

Strategy	Indicator	Baseline *(June 2014*	Targets End of Project *(Dec. 2019)*	End of Project (EOP) Status	Rating and Terminal Evaluation Comments
for Biomass Energy for heating are agreed and established.	targets have been established.		start.	at the oblast level. These were either specific oblast-level plans on bioenergy or addition of bioenergy to existing oblast plans. In all eight cases the plans (or additions to plans) were officially adopted.	oblast level plans for bioenergy are an acceptable adjustment. The TE's main concern about this work is that there was no follow up to ensure the adopted plans are implemented. Without follow-up support, these plans may sit on a shelf. Yet, adoption of 8 oblast-level plans is a strong achievement and appears to meet the level of challenge of what was targeted.
Outcome 2: Capacity available within MAPF to support development and implementation of a municipal biomass programme through the establishment of a Biomass Support Unit.	Number of staff who participated in and successfully completed capacity development programme, including training on the Municipal Biomass Guide.	None available at the present time.	Ten staff trained within 15 months of recruitment of project manager.	There was never really a capacity development program of national government staff. The project in a way has supported on-the-job training of its roster of 9 bioenergy expert consultants. The team members, who have technical backgrounds, are now skilled in dealing with municipal clients and putting emphasis on financial viability of projects. The project further set up a biomass working group that met 5 times and provided good exposure to those involved regarding biomass (though focus was not on agri-biomass). Project also indicates 50 one-day trainings were conducted in municipalities at rayon level, though only 14 were confirmed. Yet, TE team believes those trainings are more appropriately counted as awareness raising (Outcome 4) as the aim of Outcome 2 was to develop people who can support bioenergy projects rather than convince clients to carry out such projects.	MU: Project didn't really achieve what it set out or what indicator indicates. There was not any well-organized training of national-level government officials. The right group would have been SAEE, but the project did not shift in its government cooperation to SAEE until the last 1.5 years of the project and did not carry out a training program with them. The development of nine private sector consultants via the roster's on-the-job training is promising. Yet, it would be best if some sustainability measures were taken with regard to this roster. The biomass working group under Ministry of Ecology met just five times and is no longer meeting. It is likely to have built some capacity, but not like an organized program would have.

Strategy	Indicator	Baseline *(June 2014*	Targets End of Project *(Dec. 2019)*	End of Project (EOP) Status	Rating and Terminal Evaluation Comments
Outcome 3: Investment promotion in municipal biomass through establishment and strengthening of a Financial Support Mechanism (FSM).	Funding available from DerzhZemBank, including funds under FSM, to support preparation of feasibility studies, business plans and investment.	Not presently available.	Construction of at least 18 municipal biomass projects completed by the end of the project.	At time of drafting of this report, an estimated 10 municipal biomass projects completed. (Note: We count each location as one project even if it has two or three boilers. Thus, there are 3 projects in Zhytomyr, 3 in Uman, 1 in Kyiv, 1 at Donetsk site, 1 at Odessa Hospital #11, and 1 at Nevytske Village.)	MS: Project was somewhat weak on this indicator as during first 3.5 years (and subsequent 0.5 year interim period) it did not aim to stimulate economically viable municipal biomass projects, but instead used project funds for 100% of procurement and installation costs, with cities contributing a relatively small share of investment for additional aspects, such as cement base. While the indicator target does not address it, TE team believes it significant to evaluation that municipal loans were restarted due to project and one bioenergy loan was made. We consider this a positive achievement.
Outcome 4: Outreach programme and dissemination of project experience/best practices/lessons learned for replication throughout the country.	Outreach programme formulated. Project experience compiled, analysed and disseminated.	Lack of sufficient information to pursue programme.	Increased awareness among stakeholders in place to promote and develop the market for municipal biomass.	The indicator as stated may not have been achieved, as there are no indications that project experience has been complied, analysed, and disseminated. Based on the target statement (which, by the way, is not specific enough), however, the achievement of the "indicator" seems stronger: It is true that there is increased awareness among stakeholders. This has been achieved through the project straw pellet boilers to some extent and to a greater extent through the domestic study tour and through the 47 pipeline projects that are being developed through interaction of the biomass expert roster and the municipalities.	MS with potential to raise to S by EOP if case study promotional materials on pipeline of 48 projects prepared: Awareness has been raised to a great extent by the current municipal bioenergy pipeline work being carried out. The 2-day domestic study tour, with over 50 participants, was also a great success in this regard. Considering the indicator statement's second sentence of "Project experience compiled, analysed, and disseminated," if the project team/ biomass roster consultants are able to prepare 1 or 2 page case studies of as many of the 48 pipeline projects that are considered to have good economic viability; and these are collated and distributed along with a lessons learned summary, status of this indicator could be raised to S.

Annex 7. UNEG Code of Conduct Agreement Form

Evaluators/Consultants:
1. Must present information that is complete and fair in its assessment of strengths and weaknesses so that decisions or actions taken are well founded.
2. Must disclose the full set of evaluation findings along with information on their limitations and have this accessible to all affected by the evaluation with expressed legal rights to receive results.
3. Should protect the anonymity and confidentiality of individual informants. They should provide maximum notice, minimize demands on time, and respect people's right not to engage. Evaluators must respect people's right to provide information in confidence, and must ensure that sensitive information cannot be traced to its source. Evaluators are not expected to evaluate individuals, and must balance an evaluation of management functions with this general principle.
4. Sometimes uncover evidence of wrongdoing while conducting evaluations. Such cases must be reported discreetly to the appropriate investigative body. Evaluators should consult with other relevant oversight entities when there is any doubt about if and how issues should be reported.
5. Should be sensitive to beliefs, manners and customs and act with integrity and honesty in their relations with all stakeholders. In line with the UN Universal Declaration of Human Rights, evaluators must be sensitive to and address issues of discrimination and gender equality. They should avoid offending the dignity and self-respect of those persons with whom they come in contact in the course of the evaluation. Knowing that evaluation might negatively affect the interests of some stakeholders, evaluators should conduct the evaluation and communicate its purpose and results in a way that clearly respects the stakeholders' dignity and self-worth.
6. Are responsible for their performance and their product(s). They are responsible for the clear, accurate and fair written and/or oral presentation of study limitations, findings and recommendations.
7. Should reflect sound accounting procedures and be prudent in using the resources of the evaluation.

Evaluation Consultant Agreement Form[1]

Agreement to abide by the Code of Conduct for Evaluation in the UN System

Name of Consultant: Eugenia Katsigris

Name of Consultancy Organization (where relevant): Parnon

I confirm that I have received and understood and will abide by the United Nations Code of Conduct for Evaluation.

Signed at Dallas on 9/24/2019

Signature: Eugenia Katsigris

Evaluation Consultant Agreement Form[2]

Agreement to abide by the Code of Conduct for Evaluation in the UN System

Name of Consultant: Igor Komendo

Name of Consultancy Organization (where relevant): -

I confirm that I have received and understood and will abide by the United Nations Code of Conduct for Evaluation.

Signed at Kyiv on 9/24/2019

Signature: Igor Komendo

Annex 8. Terminal Evaluation TOR

Project name:	Development and Commercialization of Bioenergy Technologies in the Municipal Sector in Ukraine
Post title:	International Consultant for the Terminal Evaluation (TE) of full-sized UNDP-GEF project
Type of contract:	Individual Contract (IC)
Assignment type:	International Consultant
Country / Duty Station:	Home Based with a 2-week mission (10 working days not including travel days) to Ukraine
Expected places of travel (if applicable):	Kyiv, Ukraine and day trips to pilot projects in other parts of Ukraine
Languages required:	English, knowledge of Ukrainian (or Russian) is an asset
Starting date of assignment:	August 2019 – October 2019
Duration of Contract:	32 working days spread over a three months period
Duration of Assignment:	32 working days of which a minimum of 14 working days which must be spent in Ukraine
Payment arrangements:	Lump-sum contract (payments linked to satisfactory performance and delivery of results)
Administrative arrangements:	UNDP Ukraine will arrange travel to Kyiv, Ukraine and transport for day trips within Ukraine. The international consultants shall be paid for their travel by UNDP Ukraine in accordance with UNDP rules and regulations.
Evaluation method:	Desk review with validation interview
Application deadline:	31st May 2019

Please note that UNDP is not in the position to accept incomplete applications - please make sure that your application contains all details as specified below in this notice.

INTRODUCTION

In accordance with UNDP and GEF M&E policies and procedures, all full and medium-sized UNDP-supported GEF-financed projects are required to undergo a terminal evaluation upon completion of implementation. These terms of reference (TOR) sets out the expectations for a Terminal Evaluation (TE) of the full-sized project "Development and Commercialization of Bioenergy Technologies in the Municipal Sector of Ukraine" project (PIMS number 2921).
The essentials of the project to be evaluated are as follows:

PROJECT SUMMARY TABLE

Project Title:	Development and Commercialization of Bioenergy Technologies in the Municipal Sector of Ukraine			
GEF Project ID:	4377		at endorsement (Million US$)	at completion (Million US$)
UNDP Project ID:	2921	GEF financing:	4.7	4.7
Country:	Ukraine	IA/EA own:	0.9	0.9
Region:	Europe and CIS	Government:	3.27	3.2

Focal Area:	Climate Change	Other:	25.89	25.89
FA Objectives, (OP/SP):	Objective 3: Promote Investment in Renewable Energy Technologies	Total co-financing:	30.06	30.06
Executing Agency:	UNDP	Total Project Cost:	34.76 (* as per ProDoc)	
Other Partners involved:	State Agency on Energy Efficiency and Energy Saving of Ukraine; Ministry of Ecology and Natural Resources of Ukraine	ProDoc Signature (date project began):		24.06.2014
		(Operational) Closing Date:	Proposed: 31.12.2019	Actual: 31.12.2019

OBJECTIVE AND SCOPE

The project was designed to accelerate sustainable agricultural biomass utilization for municipal heat and hot water services in Ukraine over its five-year implementation period (2014-2019) to enable Ukraine to substantially move closer to its target of having some 7% of the country's annual primary energy requirements for heating and hot water services supplied by biomass by 2035, as outlined in the "Energy Strategy of Ukraine to 2035".

The project is also to contribute to the reduction of GHG emissions by creating a favorable legal, regulatory and market environment and building institutional, administrative and technical capacities to promote the utilization of the country's extensive agricultural biomass potential for municipal heat and hot water services.

Since its commencement in 2014, the project has contributed to shaping the renewable energy policy in Ukraine, and successfully implemented pilot activities demonstrating benefits of agrarian biomass for municipalities. The project has provided substantial capacity building assistance to the Government of Ukraine, and particularly to the State Agency for Energy Efficiency, responsible for the renewable energy policy of Ukraine. Municipal Biomass Programmes have been developed for 7 pilot oblasts (Poltava, Ivano-Frankivsk, Zakarpattia, Volyn, Dnipropetrovsk, Zhytomyr and Cherkasy).

Four Draft Laws (#4334 to stimulate the production of heat energy from alternative energy sources; #4580 on the transfer of authority to set tariffs and licensing; #4581 on signing long-term contracts for the supply of heat energy; and #4643 on improvement of relationships in the heating sector) were drafted with substantial input from the project and registered in the Parliament of Ukraine. In partnership with IFC, the project has developed the design for a Financial Support Mechanism aimed to stimulate investment in the bioenergy by municipalities. The project is funded by the Global Environment Facility (GEF), with the total GEF contribution of USD 4,700,000 and is implemented by UNDP in Ukraine,

reporting both in specific GEF and UNDP formats. The project aims to achieve this target by introducing a conducive regulatory framework and by establishing a financial support mechanism (FSM) that together will facilitate private sector participation in utilizing agricultural biomass to supply municipal heat and hot water services and assist the Government in closing private sector funded investments in municipal biomass. One of the key outputs of the Project is providing technical assistance to municipalities in developing feasibility studies, business plans and technical design documents for municipal biomass heat and hot water systems.
In 2016 in cooperation with the GEF Small Grants Programme and local non-governmental organizations several pilot projects on planting energy willow have been launched in Zakarpattia oblast, Poltava oblast, and Ivano-Frankivsk oblast.

In 2015-2016 ten municipal bioenergy pilot projects have been implemented in different municipalities. In September 2018 the Project has started a contest among municipalities seeking for technical assistance for adoption of agricultural biomass-based heating technologies. It is intended to provide technical assistance with developing feasibility studies and technical designs for biomass heating installations for up to 25 municipalities during the period between November 2018 and September 2019. By May 2019 14 feasibility studies and 1 technical design have been prepared; 14 municipal bioenergy projects have been completed under the UNDP assistance.

The TE will be conducted according to the guidance, rules and procedures established by UNDP and GEF as reflected in the UNDP Evaluation Guidelines[14] and UNDP Guidance for Conducting Terminal Evaluations of UNDP-supported GEF-financed Projects[15].

The objectives of the evaluation are to assess the achievement of project results, and to draw lessons that can both improve the sustainability of benefits from this project, and aid in the overall enhancement of UNDP programming.

Evaluation approach and method

An overall approach and method for conducting project terminal evaluations of UNDP-supported GEF-financed projects has developed over time. The evaluator is expected to frame the evaluation effort using the criteria of **relevance, effectiveness, efficiency, sustainability, and impact** (see Annex C), as defined and explained in the UNDP Guidance for Conducting Terminal Evaluations of UNDP-Supported, GEF-financed Projects. A set of questions covering each of these criteria have been drafted and are included with this TOR. The evaluator is expected to amend, complete and submit this matrix as part of an evaluation inception report, and shall include it as an annex to the final report.

The evaluation must provide evidence-based information that is credible, reliable and useful. The evaluator is expected to follow a participatory and consultative approach ensuring close engagement with government counterparts, in particular, the GEF operational focal point, UNDP Country Office, project team, UNDP GEF Technical Adviser based in the region and key stakeholders. The evaluator is expected to conduct a field mission to Kyiv and Zhytomyr, including the following project sites (Zhytomyr School #1, the National Center for Ecology and Nature). Interviews will be held with the following organizations:

1) State Agency for Energy Efficiency
2) Ministry of Regional Development, Construction, Housing and Communal Services
3) Verkhovna Rada
4) Ministry of Ecology and Natural Resources, GEF Focal Point

[14] http://web.undp.org/evaluation/guideline/documents/PDF/UNDP_Evaluation_Guidelines.pdf
[15] http://web.undp.org/evaluation/documents/guidance/GEF/UNDP-GEF-TE-Guide.pdf

5) Oblast state administrations: Poltava, Ivano-Frankivsk, Zakarpattia, Volyn, Dnipropetrovsk, Zhytomyr and Cherkasy
6) Recipients of UNDP grant support:
   - Cherkaske Village Council;
   - National Center for Ecology and Nature (Kyiv);
   - Nevytske village council;
   - Uman School #9;
   - Uman School #12;
   - Uman Daycare center #21;
   - Zhytomyr School #1;
   - Zhytomyr Daycare center #10;
   - Zhytomyr Agrarian University;
7) Recipients of the technical assistance from UNDP:
   - Bakhmut City Council;
   - Berezdiv Village Council;
   - Divychky Amalgamated Territorial Community (ATC);
   - Kherson City Council;
   - Korosten City Council;
   - Kupyansk City Council;
   - Irshava ATC;
   - Mykhailo-Kotsiubynske ATC;
   - Odesa Hospital #11;
   - Radekhiv City Council;
   - Starokostiantyniv City Council;
   - Uman City Council;
   - Voznesensk City Council;
   - Zaytseve ATC.
8) Association of local self-governments "Association of Ukrainian Cities"
9) Bioenergy Association of Ukraine
10) International Financial Corporation
11) Ukrgasbank AB
12) Oschadbank PJSC
13) 'Ecomerezha' NGO, Zaporizhzhya
14) 'Shyrokiy Step' NGO, Ivano-Frankivsk oblast, Kolomyya
15) 'Molochay' NGO, Zaporizhzhya

The evaluator will review all relevant sources of information, such as the project document, project reports – incl. Annual APR/PIR and other Reports, project budget revisions, midterm review, progress reports, GEF focal area tracking tools, project files, national strategic and legal documents, and any other material that the evaluator considers useful for this evidence-based assessment. A list of documents that the project team will provide to the evaluator for review is included in TOR Annex B of this Terms of Reference.

Detailed Scope of work

The International consultant will assess the following four categories of project progress. See the Guidance for Conducting Final Evaluations of UNDP-Supported, GEF-Financed Projects for additional information.

1. Project Strategy
Project design:

- Review the problem addressed by the project and the underlying assumptions. Review the effect of any incorrect assumptions or changes to the context to achieving the project results as outlined in the Project Document.
- Review the relevance of the project strategy and assess whether it provides the most effective route towards expected/intended results. Were lessons from other relevant projects properly incorporated into the project design?
- Review how the project addresses country priorities. Review country ownership. Was the project concept in line with the national sector development priorities and plans of the country (or of participating countries in the case of multi-country projects)?
- Review decision-making processes: were perspectives of those who would be affected by project decisions, those who could affect the outcomes, and those who could contribute information or other resources to the process, taken into account during project design processes?
- Review the extent to which relevant gender issues were raised in the project design.
- Review to what extend did the project contribute to the SDGs and the UNDP Strategic Plan?
- If there are major areas of concern, recommend areas for improvement.

Results Framework/Logframe:
- Undertake a critical analysis of the project's logframe indicators and targets, assess how "SMART" the midterm and end-of-project targets are (Specific, Measurable, Attainable, Relevant, Time-bound), and suggest specific amendments/revisions to the targets and indicators as necessary.
- Are the project's objectives and outcomes or components clear, practical, and feasible within the project's time frame?
- Examine if progress so far has led to or could in the future catalyze beneficial development effects (i.e. improved energy independence, improved condition in the local schools / hospitals / other public buildings, etc.) that should be included in the project results framework and monitored on an annual basis.
- Ensure broader development and gender aspects of the project are being monitored effectively. Develop and recommend SMART 'development' indicators, including sex-disaggregated indicators and indicators that capture development benefits.

2. Progress Towards Results
Progress Towards Outcomes Analysis:
Review the logframe indicators against progress made towards the end-of-project targets using the Progress Towards Results Matrix and following the Guidance For Conducting Final Evaluations of UNDP-Supported, GEF-Financed Projects; colour code progress in a "traffic light system" based on the level of progress achieved; assign a rating on progress for each outcome; make recommendations from the areas marked as "Not on target to be achieved" (red).

Project strategy	Indicator[16]	Baseline level[17]	Level in 1st PIR (self-reported)	Midterm target[18]	End of project target	Midterm level and assessment[19]	Achievement rating[20]	Justification for rating
Objective:	Indicator (if applicable):							
	Indicator 1:							

[16] Populate with data from the Logframe and scorecards
[17] Populate with data from the Project Document
[18] If available
[19] Color code this column only
[20] Use the 6-point Progress Towards Result Rating: HS, S, MS, MU, U, HU

Outcome 1:	Indicator 2:							
Outcome 2:	Indicator 1:							
	Indicator 2:							
Etc.								

Indicator Assessment Key

Green = Achieved	Yellow = On target to be achieved	Red = Not on target to be achieved

In addition to the progress towards outcomes analysis:
- Compare and analyze the GEF Tracking Tool at the Baseline with the one completed right before the Final Evaluation.
- By reviewing the aspects of the project that have already been successful, identify ways in which the project can further expand these benefits;
  By reviewing the aspects of the project that were not successful, identify lessons learned for future interventions;
- Make sure the data used is gender-disaggregated, whereas the progress analysis is gender-sensitive.

3. Project Implementation and Adaptive Management

Management Arrangements:
- Review overall effectiveness of project management as outlined in the Project Document. Have changes been made and are they effective? Are responsibilities and reporting lines clear? Is decision-making transparent and undertaken in a timely manner? Recommend areas for improvement.
- Review the quality of execution of the Executing Agency/Implementing Partner(s) and recommend areas for improvement.
- Review the quality of support provided by the GEF Partner Agency (UNDP) and recommend areas for improvement.

Overall Effectiveness
- Did the project achieve 18 municipal biomass systems brought on-line?
- Did the project deliver cumulative energy savings of 285 GWh in terms of heat and hot water generated?
- Did the project contribute to establishing and adopting Municipal Targets for Biomass Energy in at least five oblasts of Ukraine?
- Did the project contribute to establishing a Financial Support Mechanism (FSM) that continues to operate beyond project lifetime?

EVALUATION CRITERIA & RATINGS

An assessment of project performance will be carried out, based against expectations set out in the Project Logical Framework/Results Framework (see Annex A), which provides performance and impact indicators for project implementation along with their corresponding means of verification. The evaluation will at minimum cover the criteria of: **relevance, effectiveness, efficiency, sustainability and impact**. Ratings must be provided on the following performance criteria. The competed table must be included in the evaluation executive summary. The obligatory rating scales are included in TOR Annex D.

PROJECT FINANCE / CO-FINANCE

The Evaluation will assess the key financial aspects of the project, including the extent of co-financing planned and realized. Project cost and funding data will be required, including annual expenditures. Variances between planned and actual expenditures will need to be assessed and explained. Results from recent financial audits, as available, should be taken into consideration. The evaluator(s) will receive assistance from the Country Office (CO) and Project Team to obtain financial data in order to complete the co-financing table below, which will be included in the terminal evaluation report.

Co-financing (type/source)	UNDP own financing (mill. US$)		Government (mill. US$)		Partner Agency (mill. US$)		Total (mill. US$)	
	Planned	Actual	Planned	Actual	Planned	Actual	Actual	Actual
Grants								
Loans/Concessions								
• In-kind support								
• Other								
Totals								

Project-level Monitoring and Evaluation Systems:

- Review the monitoring tools that were being used including PIR reporting and quarterly financial reporting: Do they provide the necessary information? Do they involve key partners? Are they aligned or mainstreamed with national systems? Do they use existing information? Are they efficient? Are they cost-effective? Are additional tools required? How could they be made more participatory and inclusive?
- Examine the financial management of the project monitoring and evaluation budget. Are sufficient resources being allocated to monitoring and evaluation? Are these resources being allocated effectively?

Stakeholder Engagement:

- Project management: Has the project developed and leveraged the necessary and appropriate partnerships with direct and tangential stakeholders?
- Participation and country-driven processes: Do local and national government stakeholders support the objectives of the project? Do they continue to have an active role in project decision-making that supports efficient and effective project implementation?
- Participation and public awareness: To what extent has stakeholder involvement and public awareness contributed to the progress towards achievement of project objectives?

Reporting:

- Assess how adaptive management changes have been reported by the project management and shared with the Project Board including assessing how well the project has worked with UNDP Ukraine and the UNDP Istanbul Regional Hub in identifying and implementing adaptive management measures
- Assess how well the Project international consultant and partners undertake and fulfil GEF reporting requirements (i.e. how have they addressed poorly-rated PIRs, if applicable?)
- Assess how lessons derived from the adaptive management process has been documented, shared with key partners and internalized by partners.

Communications:

- Review internal project communication with stakeholders: Is communication regular and effective? Are there key stakeholders left out of communication? Are there feedback mechanisms when communication is received? Does this communication with stakeholders contribute to their awareness of project outcomes and activities and investment in the sustainability of project results?

- Review external project communication: Are proper means of communication established or being established to express the project progress and intended impact to the public (is there a web presence, for example? Or did the project implement appropriate outreach and public awareness campaigns?)
- For reporting purposes, write one half-page paragraph that summarizes the project's progress towards results in terms of contribution to sustainable development benefits, as well as global environmental benefits.

MAINSTREAMING

UNDP-supported GEF-financed projects are key components in UNDP country programming, as well as regional and global programmes. The evaluation will assess the extent to which the project was successfully mainstreamed with other UNDP priorities, including poverty alleviation, improved governance, the prevention and recovery from natural disasters, and gender.

IMPACT

The evaluators will assess the extent to which the project is achieving impacts or progressing towards the achievement of impacts. Key findings that should be brought out in the evaluations include whether the project has demonstrated: a) verifiable improvements in ecological status; b) verifiable reductions in stress on ecological systems, and/or c) demonstrated progress towards these impact achievements.

CONCLUSIONS, RECOMMENDATIONS & LESSONS

The evaluation report must include a chapter providing a set of **conclusions, recommendations** and **lessons**.

IMPLEMENTATION ARRANGEMENTS

The principal responsibility for managing this evaluation resides with the UNDP CO in Ukraine. The UNDP CO will contract the evaluators and ensure the timely provision of per diems and travel arrangements within the country for the evaluation team. The Project Team will be responsible for liaising with the Evaluators team to set up stakeholder interviews, arrange field visits, coordinate with the Government etc.

Duty station
Home-based with 10 working days mission to Ukraine which should be carried out within 3 weeks of the signing of the contract between the Parties.

Travel
- International travel (10 working days - mission) will be required to Ukraine which is called the Terminal Evaluation mission; This 10 working days mission does not include travel days or weekend days. Travel costs need not to be included in the financial proposal. They will be paid for separately by UNDP.

EVALUATION TIMEFRAME

The total duration of the evaluation will be 32 days according to the following plan:

Activity	Timing	Completion Date
Preparation	*5* days	*15.08.2019*
Evaluation Mission	*10* days	*15.09.2019*
Draft Evaluation Report	*15* days	*10.10.2019*
Final Report	*2* days	*30.10.2019*

EVALUATION DELIVERABLES

The evaluation team is expected to deliver the following:

Deliverable	Content	Timing	Responsibilities
Inception Report	Evaluator provides clarifications on timing and method	No later than 2 weeks before the evaluation mission.	Evaluator submits to UNDP CO
Presentation	Initial Findings	End of evaluation mission	To project management, UNDP CO
Draft Final Report	Full report, (per annexed template) with annexes	Within 3 weeks of the evaluation mission	Sent to CO, reviewed by RTA, PCU, GEF OFPs
Final Report*	Revised report	Within 1 week of receiving UNDP comments on draft	Sent to CO for uploading to UNDP ERC.

*When submitting the final evaluation report, the evaluator is required also to provide an 'audit trail', detailing how all received comments have (and have not) been addressed in the final evaluation report.

TEAM COMPOSITION

The evaluation team will be composed of one international evaluator (team leader), and one national evaluator based in Ukraine. The consultants shall have prior experience in evaluating similar projects. Experience with GEF-financed projects is an advantage. The evaluators selected should not have participated in the project preparation and/or implementation and should not have conflict of interest with project related activities.

Expected outputs and deliverables

The international consultant is expected to deliver the following:

- Deliverable 1: Inception report summarizing key findings of the desk review of project-related documents provided by UNDP (5 days);
- Deliverable 2: TE mission; Presentation of initial findings, together with the national evaluator (10 days);
- Deliverable 3: Draft terminal evaluation report in line with the design provided in the Annex E (15 days). The draft TE report shall contain all key sections as per the requirements of UNDP evaluation guidance for GEF-financed projects: Project description and development context, findings of the evaluation, conclusions, recommendations and the lessons learnt. It shall include:
- Assessment of adequacy of the overall project concept, design, implementation methodology, institutional structure, timelines, budgetary allocation or any other aspect of the project design that the evaluation team may want to comment upon;
- Assessment of the outputs achieved by the project versus the Project Result Framework;
- Deliverable 4: Final terminal evaluation report (2 days). For this purpose, TE Team leader will:
    - Integrate the additional information provided by UNDP to the draft TE report (if any);
    - Address the comments of UNDP (CO, RTA, Project Manager) and stakeholders
    - Develop the final TE report

The international consultant will provide leading roles in terms of professional inputs, knowledge of international renewable energy policies and experience with result-based evaluation of the development programs and projects.

- Integration of the information provided by UNDP to the draft TE report, and development of the final TE report.

- The international consultant will report directly to the UNDP country office in Ukraine and responsible for coordinating the activities of the national TE consultant. The international consultant shall provide guidance and oversee the outputs delivered by the national consultant All reports are to be written in English. The international consultant should provide an electronic version of all the required deliverables.

EVALUATOR ETHICS

Evaluation consultants will be held to the highest ethical standards and are required to sign a Code of Conduct (Annex E) upon acceptance of the assignment. UNDP evaluations are conducted in accordance